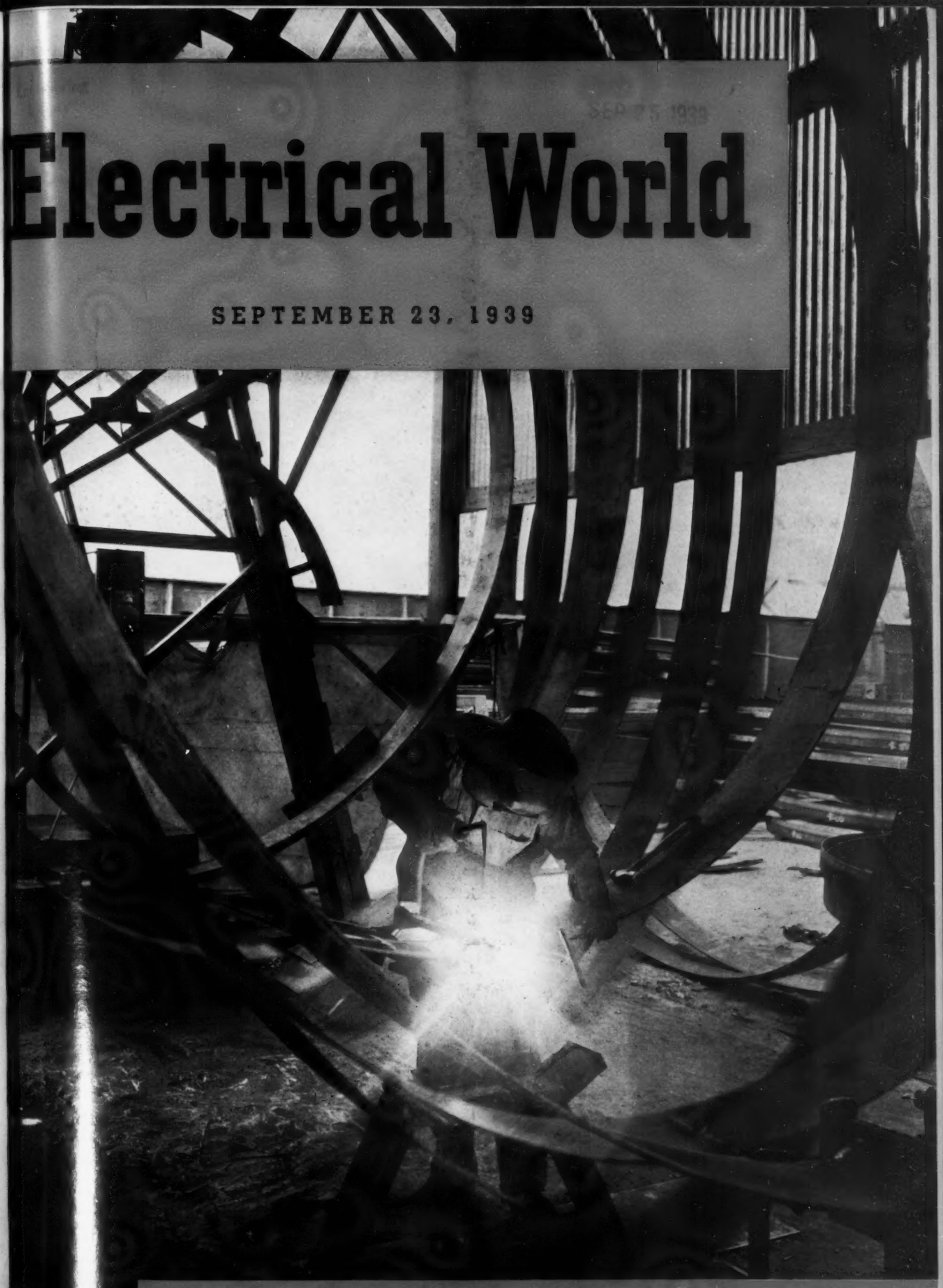
Electrical World

SEPTEMBER 23, 1939



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WESTON *Instruments*

If War Comes—

It has been said frequently of late that the conditions surrounding business at the time of the World War are no criteria for today—that times are different. Well, they are, but if the lessons of the last war do nothing more than prevent us from making the same mistakes they will be of value.

What did happen 20 to 25 years ago? We are presenting in some later pages of this issue a brief history of the effects of the war upon the electrical industry. The data taken from the pages of ELECTRICAL WORLD at that time will refresh the memory of those who have forgotten, as well as give a quick picture to those who were too young then to be interested.

However in reviewing the events of 1914–1918 one must bear in mind that conditions surrounding the electrical business, particularly in the case of the utilities, have so changed in the intervening years as to make some of the inferences of little or no value.

In 1914, for instance, the extent to which industry and the home were electrified was but a fraction of what it is today. Less than 19 per cent of the homes were wired. Only 17 per cent of industrial power was purchased electric. City and interurban transportation was then electric, where today a very large percentage is gasoline bus.

In other words, the great increase in load then came from new customers. Today we have the customers and, while the load under greatly excited industrial operations will grow, it starts from such a different point as to keep it from getting out of control.

Twenty-five years ago we did not have interconnection to help distressed areas over peak conditions, nor the same reliability or availability of apparatus. Today we have distribution networks and all of the protective devices necessary to maintain service under adverse conditions without large reserves.

Then the bottleneck was fuel transportation. Generating efficiency has improved greatly, so that a kilowatt-hour now takes 1.42 lb. of coal, where it then took about 4 lb. Thus, while output has increased six- or sevenfold since 1914, fuel requirements have scarcely doubled.

Rates, on the other hand, have been materially reduced, and in the reducing, managements have come closer to the limit of economies. Rates, therefore, might have to reflect rising costs much earlier than they did during the last war.

The average age of utility employees is much greater now than it was then—probably not far from 40 in a great many companies. Should war come, it would mean a smaller depletion of working forces.

Then the price of money caused some awkward situations. Today money is cheap, and while some inflation can be expected under prolonged war conditions, it cannot quickly get out of hand. There may have to be some changes in financing plans, but nothing so difficult as the last war, at least so long as there is a large volume of idle money.

And, finally, the previous war business came on top of a depression when nobody was prepared for a big influx of orders. We have come out of a depression and had the stimulating effects of 1937, which brought certain expansion of capacity. Today, therefore, we do have an entirely new set of conditions. In general, they seem to imply that everybody is better prepared for an emergency.

Million Variations Specified for Network Transformers

Endless differences presented for arrangement of major elements, location of accessories and provision of auxiliaries hold "standardized" units to custom-built basis — Costs, accordingly, are also on a custom-built basis

H. R. TURNER. *Transformer Division, General Electric Company, Pittsfield, Mass.*

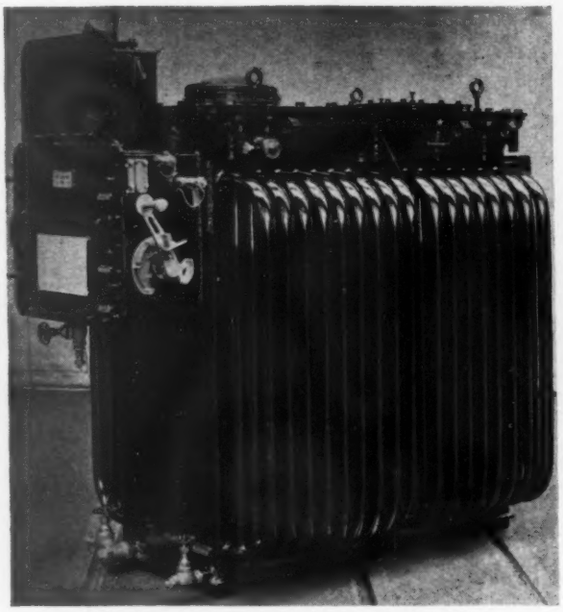
IF A BUYER wanted to have the hood of his new automobile an inch longer than usual, the wheelbase a couple of inches shorter, the positions of the speedometer and oil-pressure gage interchanged, or the top of the body raised a half inch, he could obtain such modifications, but he would know that such alterations would be reflected very decidedly in his bill, and most people would consider the extra cost not worth the advantage gained. It is on the basis of standardized production that today's automobile has been made so much better, in so much more volume, and at so much less cost, than the custom-made car of a quarter century ago.

Departures Mount Up

When it comes to obtaining network transformers, however, similar consideration of standardization of product, with its resulting advantages, has not been so evident.

Conservatively stated, a million variations in network transformers are possible. In fact, the possible combinations—how the major elements will be arranged, where the different accessories are to be located and how the auxiliaries will be mounted—can easily be shown to total several million. It is hardly necessary to say that all such combinations have not been used, but the fact remains that very many combinations have been produced. Network transformers have been "tailor-made," each calling for special work, and costs have been accordingly.

Today, however, it is possible to see a trend toward standardization in network transformers, and from such standardization will come many advantages to the purchaser.



Standardized three-phase network transformer

Unit shown is rated 500 kva., 60 cycles, 13,800 to 216Y/125 volts. Vault-type Pyranol-filled. Type HT, Form DVA.

In the fifteen years history of low-voltage a.c. network systems the network transformers have passed through a process of evolution which has produced a multiplicity of designs and arrangements. These variations have been developed as a result of the efforts of all concerned to arrive at a design which provided maximum convenience for installation, operation and maintenance.

Manufacturers have co-operated with the utilities through these years, building almost every arrangement of equipment, because it was felt that ultimately an arrangement of design would develop which offered all that was necessary from a functional standpoint and at the same time the maximum over-all economy.

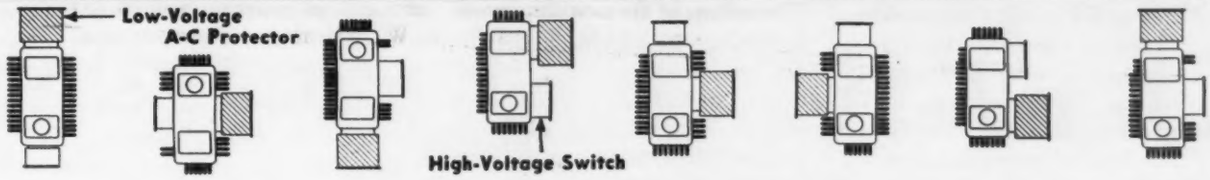
While the total market for network transformers is substantial, no one utility's purchases represent a large quantity of units, and there are so many different types of units to be built that there is no repetitive factor in the manufacture, and to all intents and purposes the cost of the transformer must be that realized when a single unit is built. It must be remembered that each of these different designs means special development, drafting, etc., all of which cost money and must be paid for.

Why cannot a reasonable degree of standardization be attained in network transformers, and with it substantial savings? A careful study of the fundamental components of network transformers shows no insurmountable obstacle to standardization.

Why Little Uniformity?

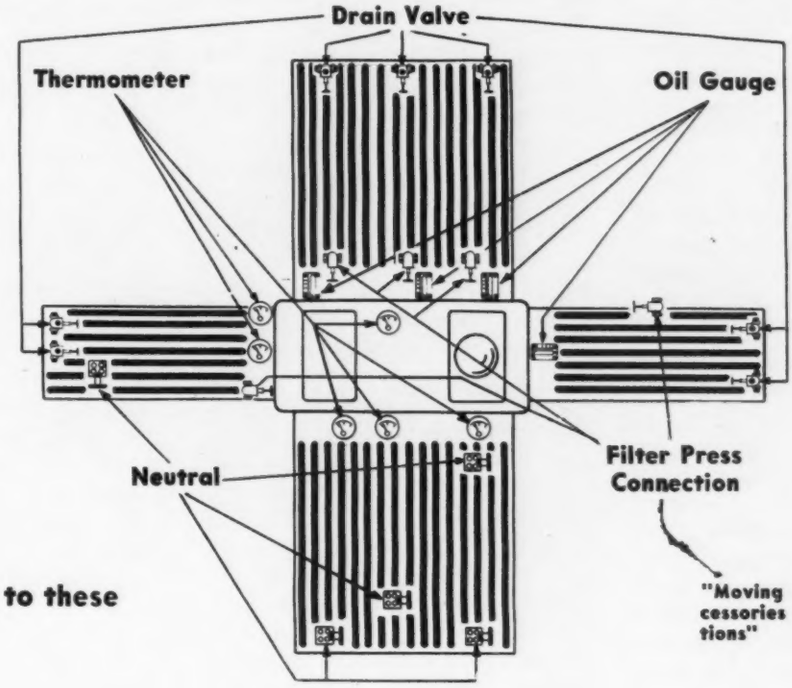
Network transformer purchases in the last few years have shown an increased percentage pointing in one definite direction, indicating that the necessary degree of standardization to accomplish worth-while benefits from the standpoint of cost can be accomplished without sacrificing in any serious degree the features which the individual utilities feel are important.

The type of transformer toward which the industry is heading is fortunate from two angles: First, from the standpoint of the designer and manufacturer, it permits designing



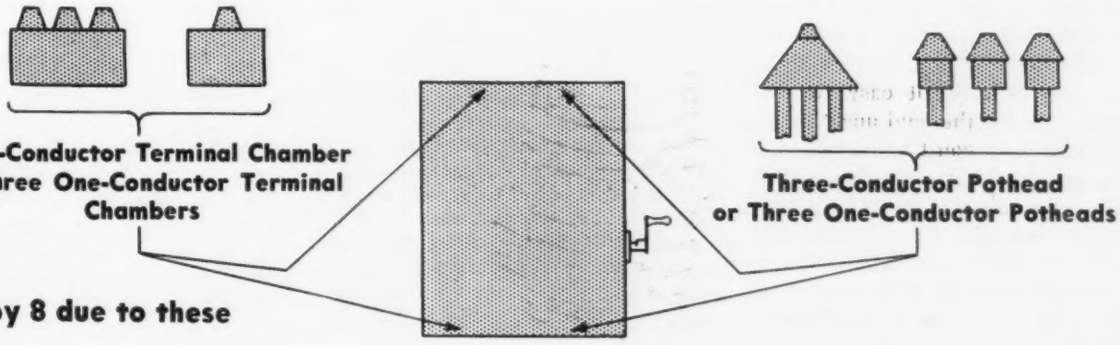
Eight basic arrangements of high-voltage and low-voltage terminal locations are multiplied by 144 due to the following possible variations:

Pyranol	Vault	5% Z	120 volts	Pri. Switch	Individual Ratio Adjusters	Sec. Bushings
Low-height oil						Junction Box
Normal-height oil	Subway	10% Z	125 volts	Primary Junction Box	Ganged Ratio Adjusters	Protector Mounting



By 768 due to these

"Moving the Location of accessories adds 4,320 combinations"


Three-Conductor Terminal Chamber or Three One-Conductor Terminal Chambers
Three-Conductor Pothead or Three One-Conductor Potheads

And by 8 due to these

To result in 7,077,888 different designs

of one frequency, kva. and high-voltage rating — not to mention handles on either and both sides of grounding switches, interlock of ratio adjuster, phasing facilities, special jack bosses, bases, etc., etc.

and building of a unit that provides the maximum space for the important components of the equipment inside the tank, the maximum room for attachment of the necessary radiation and the best physical location for the grounding and disconnecting switch and the network protector. Second, from the angle of the utility, it provides a complete unit with its network protector, which can be installed in the smallest practical vault from the standpont of cubic feet of volume, cubic feet of wall structure, strong low-cost vault roof and low installation cost.

Accessories Roam

The transformer is of the small, compact design brought about by the introduction of non-inflammable cooling liquid. It has a high-voltage grounding and disconnecting switch mounted on one end of the tank. The low-voltage network protector is mounted on the opposite end of the tank. The incoming high- and low-voltage cables enter the equipment through terminal facilities provided at the top of the high-voltage switch and the network protector. This type of transformer is coming into more general use and each year more utilities purchase this type of equipment filled with Pyranol.

Location of the accessories on the standardized equipment is important, although in this case some flexibility of arrangement is available. Such items as the drain valve, filter-press connections and low-voltage neutral, since they definitely affect the internal construction of the apparatus, must of necessity be definitely fixed on the tank. The oil gauge, sampling devices, thermometer, etc., can be assembled in one group and alternative locations on either end of the unit be provided. This degree of flexibility should make it easy for the operator to use the equipment.

Design and construction of the grounding and disconnecting switch can be worked out in a fashion which permits reasonable manufacturing conditions and at the same time allows ample freedom as to method of cable entry and the type of cable used. It is interesting here to note that there is a definite trend toward the use of terminal chambers in place of potheads for terminating the cable, and a distinct trend toward the use of three-conductor cable in preference to single-conductor cable.

The voltage of the secondary winding should be standardized. Utilities are now about equally divided between 120 and 125 volts as the nominal secondary voltage of the transformer. The trend is toward 125 volts, which is in line with the marked system trend to increase the standard lamp voltage to 120. Standardization at 125 volts can be accomplished without working any hardship on the utilities and without adverse effect on operation, even though there may be already installed a system using transformers rated at 120 volts. A modification of the nominal primary voltage to maintain the same turn ratio in the transformer will take care of this situation adequately.

It is very definitely believed that standardization along these lines is practical and that the operators will unquestionably benefit by the use of such equipment. It may, in some cases, require a definite change from the existing practice as to manhole design and construction, but it is felt that a definite economic advantage can be realized in many cases by such a change.

The standardized transformer above described gives a comparatively long and narrow unit. It can be installed in a narrow vault which is comparatively shallow in depth. These two factors produce the lowest cost vault. With shallow construction, excavation costs are reduced and in many cases the difference between 8 ft. and 10 ft. may mean the difference between using or not using sheet piling during the excavation, and may reduce the wall thickness necessary, consequently the number of yards of concrete required per vault. With the narrow construction, the cost of the roof is very materially reduced.

Top Connection

With top-connected transformers the amount of cable necessary to reach from the duct mouth to the point of connection on the transformer is shorter than is generally encountered when connecting to the bottom of the transformer. The cost of cabling is lower since the workmen doing this work can stand up in a free and easy position rather than having to work on their hands and knees. Cables can be racked neatly and securely on the vault wall at a high level so that they are less likely to be injured by falling objects and workmen cannot trip over them, thus causing personal injury, as might be the case if the cables were in the floor.

In those cases where it is necessary to make multi-bank installations —that is, where two transformers are installed in a single vault—the long, narrow vault again gives the best physical arrangement, since the low-voltage end of the two transformers can be installed facing each other and the secondaries bussed together at a common point, between the two units. This arrangement gives the maximum separation of the terminal ends of the two high-voltage feeders supplying the bank and minimizes the possibility of transmitted trouble incident to a cable fire initiating in one of the feeders. Also, the maximum possible separation is available between the high voltage and the low voltage.

Beginning in the Next Issue

Distribution Planning Series

● How to plan a distribution system for most effective use of primary and secondary conductors and of transformer and associated equipment to give best service to customers is the subject of a series of six articles that will appear in the next six issues of ELECTRICAL WORLD. The titles of the articles in order of appearance are:

"Calculating Overhead Primaries."
"Designing Distribution for Loads."
"Design of Radial Primaries."
"Fixing Regulator Settings."
"Transformer-Secondary Design for Service."
"Checking Transformer-Secondary Conditions."

The series was written by C. E. Arvidson, the second article in collaboration with L. D. Cronin, both in the engineering department of the Commonwealth & Southern Corporation. The articles are based on studies of existing systems and on practices of distribution design and operation now in actual use. The editors feel, therefore, that the series is an outstanding contribution to the practical literature of distribution engineering and will be very useful in the conditions of today.

War History

What happened to the electrical industry in the last war in terms of the trouble it brought and the accomplishments it inspired — A quick glance over the pages of the "Electrical World" during the war years

IN AUGUST, 1914, Europe burst into flames. It was the beginning of the World War. Possibly an article of the kind that follows, written some time in the future, will call it the beginning of the First World War. Possibly its successor, magnified in horror and destruction, closely awaits our uncertain steps into the future. That remains to be seen.

In view of the possibility, however, it should be interesting to electrical people to take a backward glance at the last war's effect on their industry. Perhaps it may even be profitable to do so, although some cynic has defined history as a record from which man learns nothing. For what it may be worth, then, we present here a summary of the reactions, troubles and accomplishments of the electrical industry taken from the pages of ELECTRICAL WORLD *in the war years of 1914–1918.*—THE EDITORS.

AT THE outbreak of the war our participation in it did not generally appear inevitable. Perhaps more than anything else it seemed that the war would be a boon to American industry and business, then slowly struggling out of a period of depression. It looked, to electrical manufacturers as well as to all others, like a tremendous opportunity.

The industrial capacity of the warring nations would be turned to munitions production. Their industrial man-power would be depleted by immense armies in the field. The export markets of these nations would have to be abandoned. And for their own requirements of electrical goods they would probably have to import an increasing volume from neutral countries. Such thoughts as these continually recur in many interviews, articles and news stories in ELECTRICAL WORLD from August, 1914, on into 1915.

But the high hopes of profit in export trade did not materialize. As a matter of fact, the dollar values of electrical goods in export in 1914 and 1915 were even less than in 1913. When, later, dollar value of electrical exports did rise it is questionable whether the rise was not due more to increased prices rather than to significant enlargement of volume. An editorial in the July 31, 1915, issue says that "up to the present time we have not been able to seize the opportunity of supplying neutral markets deprived by war of apparatus and appliances from Europe."

Munitions

Probably a large part of the reason for the subsidence of excitement about foreign trade in electrical goods was that electrical manufacturers were finding, through 1915 and 1916, their hands getting fuller and fuller without it. American industry and trade was becoming more and more occupied with the job of helping to feed the warring nations and of furnishing them with munitions. War supply contracts of all kinds dropped into the laps of manufacturers and traders. The rapid expansion of industrial activity thus caused required the enlargement of productive capacity in existing factories and the building of new ones.

As industrial activity increased, the demands for electrical goods rose proportionately. Motors, control equipments and wiring materials were needed in great quantities. Not only were the electrical manufacturers experiencing a growing demand for their normal products but also numbers of them were taking orders for munitions themselves. For instance a news story in the issue of May 8, 1915, tells of a $50,000,000 order for rifles to Westinghouse and of large orders for munitions to Allis-Chalmers. The June 8 issue says:

> Many reports of large orders to electrical manufacturing plants for supplies of munitions for the allied armies have been in circulation, and stocks of companies affected have been in demand on the New York market, advancing prices.

Utility Requirements

The crowded days of 1915 and 1916, however, gave electrical manufacturers hardly a foretaste of the pressure that the next two years would put on them. The higher pulse of general business was felt by the electric utilities and they, in turn, experienced an acceleration of their growth rate. They needed more and larger generating equipment, transformers, wire and all the necessaries of system expansion. For instance, a news story in the December 16, 1916, issue is headed "Enormous Market Exists for Copper Wire." The story relates that the buying is almost entirely for domestic use, most orders coming from the Middle West. This was a time when the market on copper was 35.75 cents per pound, copper wire base 5 cents more and insulated wire higher still. General Electric orders in 1916 were 70 per cent above 1915 and in the first quarter of 1917 G.E. orders were much in excess of productive capacity.

In September, 1916, it was stated that the volume of steam turbine business in that year would be 3,000,000 kw. Bear in mind that the average turbine size then was much smaller than today, that engineers were just beginning to think about machines of 45,000 kw. and larger. Deliveries were promised in a year and a half to two years or longer. In May, 1917, a month after the United States entered the war, the turbine production capacity of manufacturers was entirely sold out for the year.

Commenting on 1916, ELECTRICAL WORLD said: "Electrical manufacturers have not only had to contend with the much higher costs of materials, but with a very high degree of instability in cost, the latter fea-

ture being worse than the first. This instability has been due to two factors: the changing market prices and the difficulties of securing material deliveries, entailing heavy additional cost in keeping adequate quantities on hand." This condition grew worse in 1917 and 1918.

Electric Load Growth

In the five years from 1913 to 1918 electric utility generating capacity rose from 6.4 million kva. to 11.2 million, an increase of 75 per cent. In the five-year period just preceding the increase was 87 per cent. And in the five years before that the increase was 117 per cent. Also, from 1918 to 1923 the increase was 82 per cent. These figures, calculated from ELECTRICAL WORLD data published January 4, 1924, two for periods before, one during and one after the war, indicate that central station capacity owes little or nothing of its long pull growth to the war-time demands of 1914-1918. It is questionable indeed whether the war helped or hindered that growth. However, it is true that the war did put heavy and unforeseeable demands on certain utility systems, as is apparent from the accompanying curves of peak-load increases of individual central stations. But these curves, with their wide variations in increases of peak loads, certainly do not justify the so-common impression that the past war greatly overtaxed utility generating capacity and that a future war will do so again.

It was not until American industry had undertaken the production of vast quantities of munitions and supplies for the warring nations that the electric utilities began to feel the increased demand for power service. Some utilities were more fortunate than others in having available capacity, but those whose margins were small were quick to order additional generating equipment, and it was that action which caused the unprecedented volume of turbine business in 1916, stated earlier in this article.

An item in the May 8, 1915, issue tells of a 20,000-kw. turbine ordered for Toledo, but does not say that the order resulted from war demands for power. Instead, it states that the load on the Toledo system has increased remarkably in the last two years (not one year, if war had been the principal cause) since the management of the company had changed. Statistics representing 64 per cent of the electric utility industry showed only a 6.4 per cent rise in output for March, 1915, over March, 1914. Bearing in mind that March, 1914, was a depression month, it does not appear that the first eight months of the war had greatly affected the utility business.

But an intimation of what some utility systems would face is contained in a short story published in the December 18, 1915, issue describing a 4,750-kw. power plant built in three months for the Reming Arms & Ammunition Company. The plant went into operation on June 1 and in that same month it was decided to add 8,000 kw. in two units, both of which were working by the end of the following October.

Generating Capacity

The acceleration of rate of system capacity increase appears plainly from the statistics of generator rating totals for the 1913-1918 period. From '13 to '14 the increase was 0.2 million kw.; from '14 to '15, 0.4 million; from '15 to '16, 0.6 million; from '16 to '17, 1.0 million; from '17 to '18, 2.6 million. Apparently what the war did to central station capacity was to compress into two years the five-year growth that had been held back by the depression of 1913 and 1914.

No figures are available to show the proportions of electric utility loads in the various classes of service during the war years. But at the outbreak of the war vigorous efforts to promote central station service for industrial uses were just beginning to show major results. The war speeded up industrial load growth tremendously and in the issue of July 28, 1917, appears the first recognition in ELECTRICAL WORLD of the change in utility load curves that soon would be quite general. Under the title "Disappearance of the Evening Peak," the article tells how the "growth of high-tension industrial load in Baltimore results in morning and afternoon loads on system and in a larger load factor."

While working hard to handle the growing power load in 1915 and 1916 and in the early months of 1917, the electric utilities continued in unabated effort to promote commercial and residential use of their service. In 1914 only 15.9 per cent of the nation's population had electric service in their homes. Therefore a large part of utility selling effort in the residential field was in persuading people to take service, to use electric lights. Use of electric appliances in the home had vigorous promoters, but their activities did not loom large in the total picture.

Coal Shortage

In spite of the tremendous demands made on utility system capacity by the rapidly rising load of 1916, '17 and '18, and of the difficulty in providing capacity additions to meet those demands, it is probable that the electric utilities would have gone through the entire war period quite comfortably had it not been for another condition that soon arose to plague them.

In an editorial on "The Coal Situation," in the issue of February 3, 1917, appears the first comprehensive statement in ELECTRICAL WORLD of a situation that was soon to become very serious. Quoting:

> The annual report of the Detroit Edison Company reveals a condition quite common to central station companies in the East with reference to coal prices and deliveries. In some sections the conditions have become so acute as to warrant action on the part of the industry as a whole against the railroad companies, to which the condition may be attributed. The Detroit Edison Company, for instance, last fall was put to enormous expense in buying coal because of shortage of cars and congestion of railroads which seriously interfered with the coal supply. The interference ranged from 25 per cent curtailment of shipment from mines on one coal railroad because of car shortage all the way to absolute stoppages for days at a time, for weeks in one case, in shipments on other roads. Notwithstanding that its fuel contracts were for ample quantities and were made with twenty-two mines on four coal-carrying railroads, the company must still buy coal at high prices wherever it can be found.

For the following two years the pages of ELECTRICAL WORLD are crowded with articles, interviews, reports, editorials and news items on the coal shortage. The use of powdered coal had its beginning in those hectic days as an effort to make use of low grade fuel. Interconnection of systems as a means to conserve fuel by transferring load from old and less efficient plants to newer and more efficient ones was the subject of wide discussion. Engineers, utility leaders, business men, were peremptory in their demands for immediate development of hydro power in order to save coal. Charles P. Steinmetz sug-

gested that all of Niagara's water should be utilized and the falls turned on only on Sundays and holidays for the delectation of honeymooners and other sightseers.

The coal shortage can be more vividly described by the recital of a couple of typical instances than by detailed presentation of all its aspects. In May, 1917, the Cleveland Electric Illuminating Company was granted a 20 per cent increase in power rates because of the increased cost of coal and labor. Other utilities were forced into like positions. Later in the year the Columbus, Ohio, utility, in an effort to show its customers how serious the coal shortage was, said in a newspaper advertisement that the coal it was receiving was so poor that some of it "actually had corn growing in it as it stood in the car when received."

Power Curtailment

As the coal shortage became more acute it was clearer and clearer every day that the efforts of the electric utilities to apportion their service most effectively in the emergency were quite inadequate to the situation. Government control must be imposed and the co-operation of the public enlisted on a broad front. In August, 1917, President Wilson ordered the fixing of coal prices at certain levels for zones of the country. A fuel administrator was appointed to allocate the flow of coal from mines to users. In the December 22, 1917, issue it is stated that government work in many localities is being hampered by power shortages and that priority orders are likely to be issued in congested districts. Although there was some discussion of the legality of such orders, they were issued in many cases and their effect was to help keep essential war industries going.

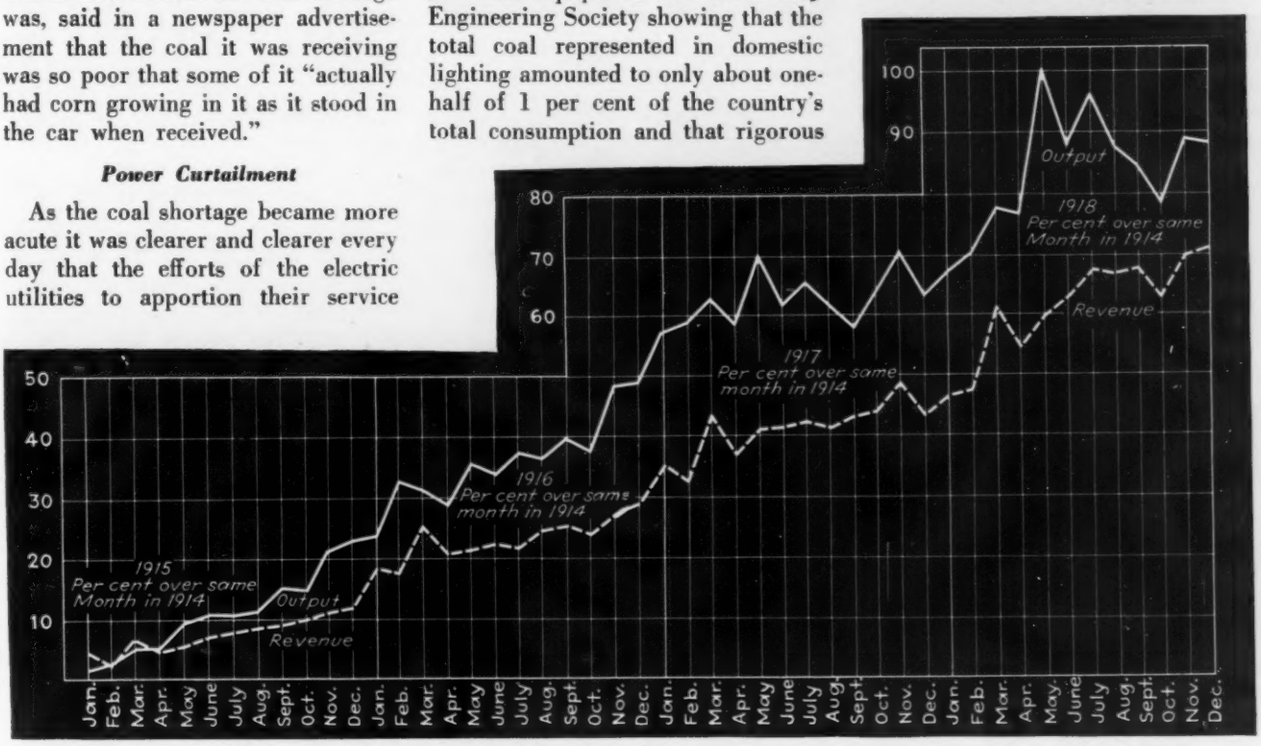
December 14, 1917, the Fuel Administration issued an order for "lightless nights" on Sunday and Thursday of each week. This order applied to sign lighting and to street lighting beyond what was necessary for public safety. Probably the "lightless nights" had considerable effect on the general public, but their efficacy as a means for fuel conservation was sharply questioned. In spite of that, however, the "lightless night" idea was carried farther to the suggestion that people cut down on light in their homes. Preston S. Millar presented a paper to the Illuminating Engineering Society showing that the total coal represented in domestic lighting amounted to only about one-half of 1 per cent of the country's total consumption and that rigorous regulation of domestic lighting might reduce the national coal consumption by as much as one- or two-tenths of 1 per cent. But still a lot of well-intentioned people "did their bit" by snapping off every light they thought was burning unnecessarily.

Further to reduce power usage and thereby to conserve fuel the fuel administrator announced "workless days," by which no coal could be used by any industrial or other establishments—except certain ones designated as essential—on the days of January 18 to 22 inclusive and on all Mondays to March 25. This order did relieve the electric utilities appreciably, in contrast with the insignificant effect of the "lightless nights."

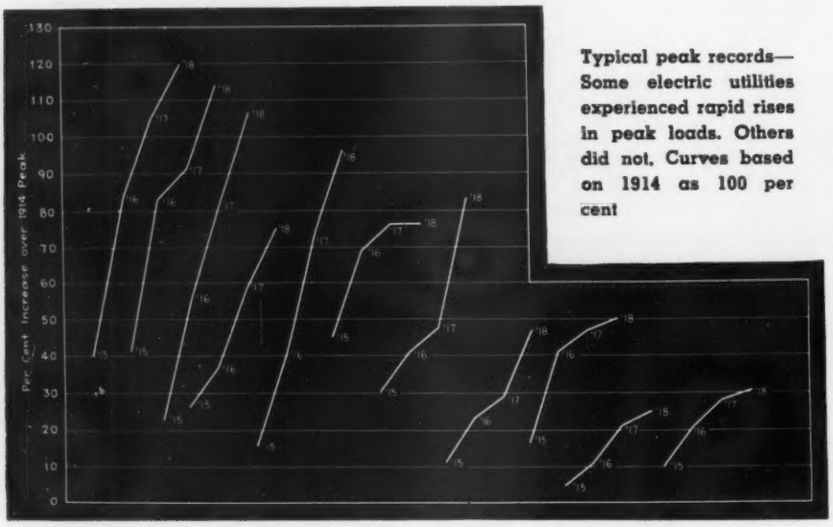
Rates

The one period in the history of the electrical industry when rates were increased was that of the World War. Then, increases were imperative if the industry was to survive and perform its function of service. "Mounting Costs Halt Rate Reductions," an article in the May 5, 1917, issue is the first ELECTRICAL WORLD recognition of the rate problem that would take more and more space on its pages in the next year or two. After instancing the greatly increased costs for coal, labor, equipment and materials borne by the utilities since the beginning of the war, the article points out that although the close regulation over them prevents the utilities from raising rates easily, "the tendency to reduce rates can be arrested sharply. In ending the movement for free-and-easy reductions the companies have as examples the European central station systems, which are known to have increased their rates generally."

In the next issue, May 12, appears the news item about the Cleveland company raising power rates, quoted earlier in this account. From then on the magazine exhibits a crowded succession of items on rate increases that



Output and revenue during the war years—These curves of monthly increases are based on 1914 as 100 per cent. That is, the value for each month is referred to the same month in 1914



Typical peak records—Some electric utilities experienced rapid rises in peak loads. Others did not. Curves based on 1914 as 100 per cent

did not end until the year 1919.

At first the efforts of the utilities to raise rates were confined to industrial power service. Because the increased production of factories was largely accomplished by working two or three shifts, the electricity they used was paid for mostly at the lower end of the rate schedule. This was right where the pinch of the kiting cost of coal was most keenly felt by the utilities. It was this condition that caused many regulatory bodies to allow the inclusion of coal clauses in industrial rates. Under the title "Rate Increases to Follow the High Cost of Coal," ELECTRICAL WORLD presented in its February 2, 1918, issue a canvass of about twenty companies on this subject. A divided opinion is somewhat apparent in the article, some utility executives thinking that increases need be only temporary and others that rates must remain on a permanently higher level. One clear-visioned optimist expressed the opinion that improvements in energy production efficiency would be sure to come with higher priced coal. Today we can testify that they did.

As the war period continued, rate increases confined alone to industrial power supply were found to be insufficient. Plant and system replacements and additions had to be made with equipments and materials whose prices were constantly rising. It was not long before these conditions made themselves felt in utility costs. Then began a quite general, and in the main successful, attempt to obtain rate increases for all classes of electric service.

Typical of the general situation are news items in the July 13, 1918, issue relating how in Illinois the regulatory commission allowed increases to several companies running up to 1½ cents per kilowatt-hour for lighting service. Another representative instance was the effort of the Atlanta, Ga., utility to obtain a 33 per cent general increase and its success in getting 10 per cent, as reported in the October 5, 1918, issue. A fairly complete résumé of the actions of state commissions on rates during the war period is available in a series of four articles published June 8, June 29, July 27 and August 31 for those who wish to pursue the subject further.

Labor and Personnel

In the war-time period before the United States entered the conflict, there was a very general improvement in the status and rewards of labor. This was the beginning of a labor rise that flowered a few years later in the "silk shirt" era. Union organizers were active and strikes were frequent, winning shorter hours and higher pay in many instances. In Bridgeport demands were made and acceded to for a 48-hour week with 60 hours pay. "Labor Unrest Spreads to Electrical Factories" is the title of a news item in the April 29, 1916, issue telling of strikes in the Westinghouse, National Conduit & Cable, Habirshaw Wire and other electrical manufacturers' plants. But when our country went into the war much of the labor unrest died down.

By and large the electric utilities came through the period of labor unrest in pretty good shape. They had a few strikes, none important. It was after the United States had declared war on Germany that the labor question began to cause some concern to the power companies. In the excitement engendered by preparedness parades, flag raisings and patriotic oratory, it was hard to keep young men, and older ones, too, interested in climbing poles, reading meters and operating switchboards. However, the condition was no worse among the utilities than in other businesses from which the man-power of the armed forces was drawn. Women substituted for substation operators and meter readers just as they did for street car conductors and elevator operators.

For essential men in key positions the utilities claimed draft exemptions and thus were able to hold operating organizations together. The practice of assuring men that their jobs would be waiting for them when they returned from service was quite general.

Financing

When Germany marched her troops through Belgium, the United States was in a business depression. It was of no help at all to the electric utilities when the already low prices of their securities were forced down even lower by the dumping of European holdings of American obligations that immediately followed the outbreak of war. In a brave voice unheard in the tumult ELECTRICAL WORLD editorially states in its August 8, 1914, issue "that the outlook for electrical securities was never better." But the outlook got worse before it got better, as is evidenced by an editorial in the September 26, 1914, issue telling of the issuance of 7 per cent scrip, redeemable within eighteen months, issued by the Philadelphia Company, as a common stock dividend.

Within a short time after war broke out the New York and other stock exchanges were closed. The several months they remained closed gave a welcome breathing spell to the electric utilities, as to others. Things began to look up a little in 1915. The issue of January 22, 1916, says that "light and power utility bonds advanced during 1915 on the average 2.5 points. A graph with the same article, however, shows that the average prices of 96 electric utility bonds never rose above 94 in 1915. In the issue of January 29, 1916, appear news notes telling of utility bond offerings of 5 and 6 per

[*Continued on page 112*]

Series Capacitors Regulate Rural Voltages Economically

Contactor shorts capacitor after full load is reached — Arrester by-passes lightning and surges around entire installation — Performance demonstrates the adequacy of capacitor in comparison with other methods of regulation

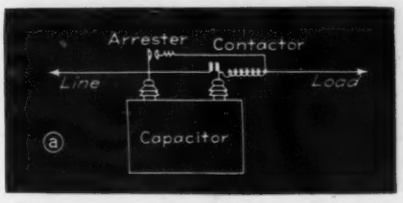
C. C. MOLER, ***Distribution Engineer, Potomac Edison Company, Hagerstown, Md.****

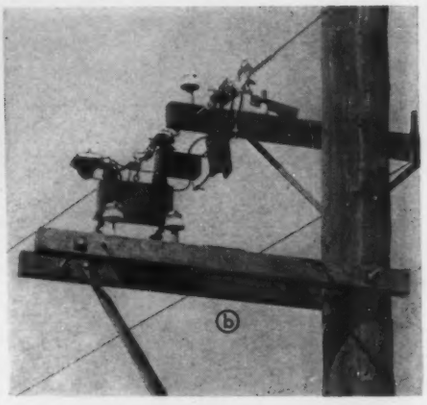
THOUGH the cost of the series capacitor itself and its characteristics for certain voltage regulation problems are very attractive, the control and protective equipment have not been so advantageous. This is probably the major reason why until recently they have not been applied to small jobs.

Several years ago we made a very satisfactory installation of a medium size series capacitor and began to feel that if the auxiliaries could be simplified and made relatively inexpensive small series capacitors would be a very economical means of regulating voltage on small jobs. We did a little experimenting and finally assembled in our own shop a small outfit.

It is a 5-kva., 460-volt capacitor with a contactor mounted on one bushing and a 500-volt arrester on the other. The contactor coil is in series with the load and contacts short circuit the capacitor when full load current is reached. The arrester by-passes the entire outfit for lightning and other surges. This is all there is to the outfit, as will be seen from the accompanying illustrations. The costs were as follows: Capacitor $45.11; arrester, $2.67; relay, $12.77. Other incidentals and labor are not included.

It was installed a little over a year ago on a 2,300-volt rural line on which there was voltage trouble. This outfit is good for 25 kva. continuous load and its characteristics are such as to meet those of the line and load in this particular case so as to give the desired regulation. If the contactor closes on overload or fault currents, it will drop out again at about 65 per cent of full load current. During the intervening time the capacitor is not effective and, of course, some low voltage may be experienced, but the period in this case cannot exceed five hours.





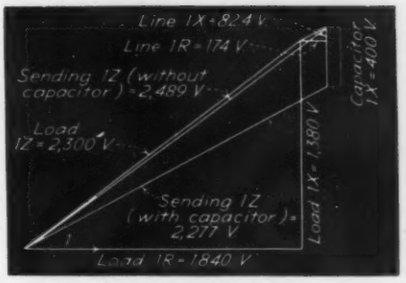
Contactor cuts out capacitor at full load and arrester by-passes surges. Cutout and pumpers in (b) are for taking capacitor out of service

It is possible to arrange for the contacts to drop out at a higher per cent of full load. From the vector diagram it will be seen that the capacitive reactance of the capacitor neutralizes the reactance of the line and part of the reactance of the load. With an average power factor of 80 per cent, this was found to be about the right value. The power factor of the load in this case never exceeds 85 per cent.

Performance Satisfactory

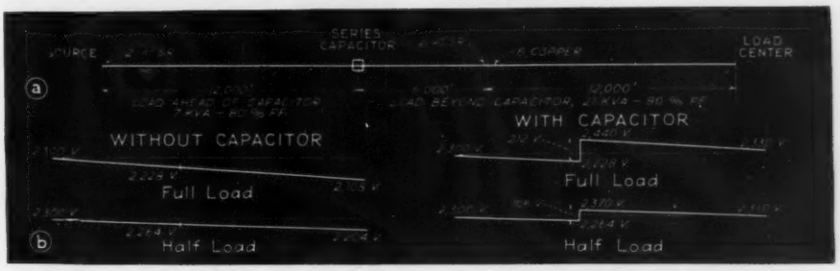
The installation has been in service about thirteen months and is entirely satisfactory. A transformer was burned out by lightning on an adjacent pole last summer, but there was no damage to the capacitor. We do not have a counter on the contactor, but a piece of paper is ar-

[*Continued on page* 123]


Line 1X = 824 V
Line 1R = 174 V
Sending 1Z (without capacitor) = 2,489 V
Load 1Z = 2,300 V
Capacitor 1X = 400 V
Load 1X = 1,580 V
Sending 1Z (with capacitor) = 2,277 V
Load 1R = 1840 V

Advantageous load center effect of series capacitor at full load and 80 per cent power factor

There is a rise in voltage across the capacitor directly proportional to the current flowing through it. This voltage rise is 90 deg. out of phase with the current, while the phase relationship to the line voltage depends upon the power factor. With a lagging power factor of around 80 per cent a very satisfactory set-up of conditions is brought about.



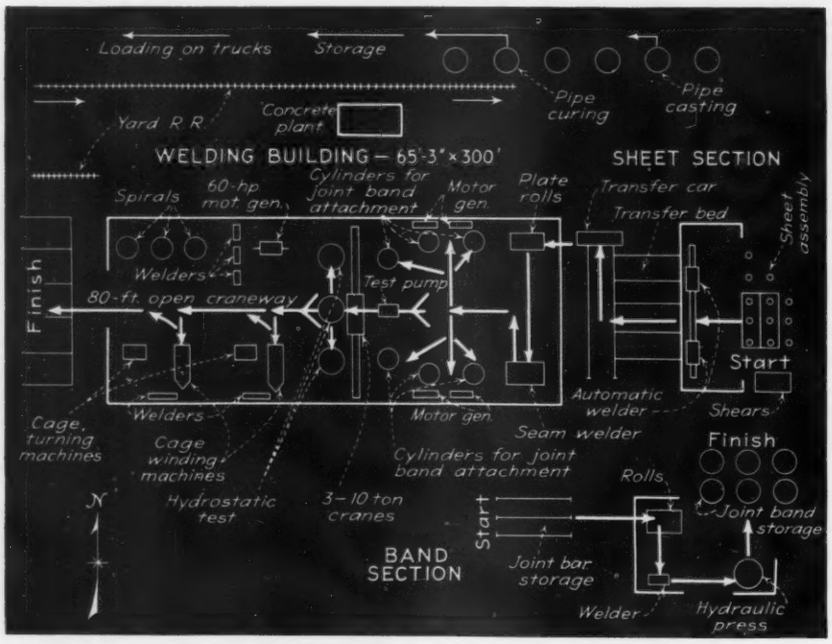
Capacitor jacks voltage to normal on 2.3-kv., single-phase line

(a) Existing loads and line conditions studied for wide range of operating conditions assumed. (b) Primary voltage bettered by 200 volts at full load.

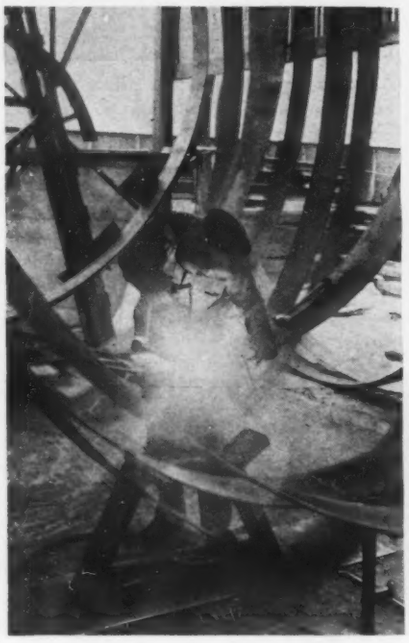
*Abstracted from paper to Maryland Utility Association.

Arc Weld 5,100 Precast Pipe Assemblies in Field

Boston water supply uses electric welding to fabricate combination steel liner and reinforcement assemblies for aqueduct pipe — Factory set up in field employs production line methods



Production line through field plant for welding processes shown by heavy arrows



Welding 5/16 x 10-in. bell-and-spigot joint bands for steel assemblies, using Lincoln "Shield-Arc" 200-amp. welder

Seam welding sheets with Linde Automatic welder using "Unionmelt" process; sheets range from U.S. Steel gage No. 10 to 9/32 in. thick

LARGE-SCALE field manufacture of heavy reinforced concrete pipe in sizes up to 12.5 ft. diameter for the 18-mile pressure aqueduct now under construction for Boston's water supply requires the use of electric arc welding on a mass production basis. The pipe sections, complete, weigh from 40 to 50 tons apiece. The production of pipe is accomplished at a plant in Natick, near the middle of the line, purchased power being used for all operations. About 5,100 electric welded steel assemblies will be required to reinforce the aqueduct pipe on the entire job.

Precast pipe was adopted as being less expensive than pressure conduit built in place. The production rating of the plant is 35 pipe assemblies per day and the installation includes a bending shop for pipe rings or bands; hydraulic press building, in which the rings are stretched about 1 in. in diameter, bringing them to circular form and true size; a sheet welding plant and an assembly shop, in which the steel shells are rolled and welded, the joint rings welded to place, the spiral reinforcement wrapped and welded and the hydrostatic test completed.

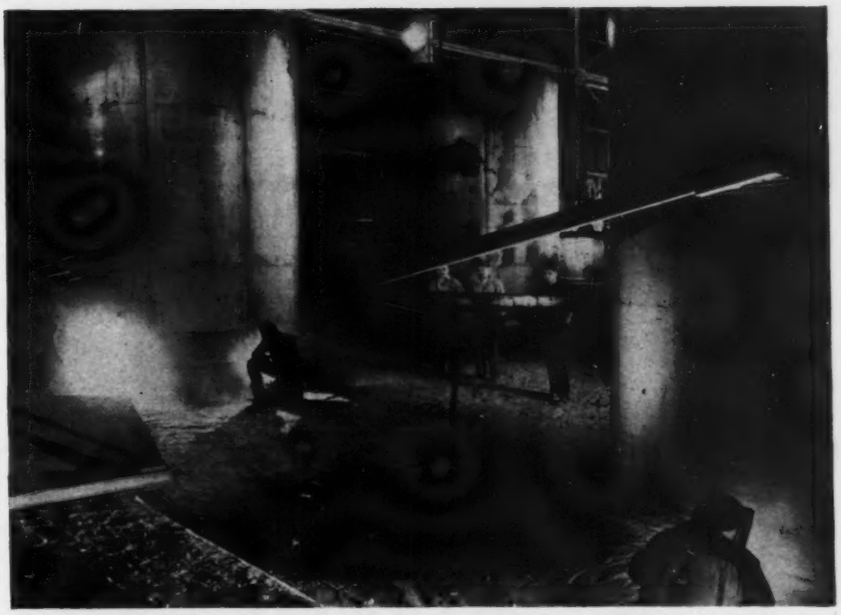
These steel assemblies, when completed, are sheet steel cylinders to which are welded bell-and-spigot joint bands, and encircled with two layers of reinforcing rod. To certain special assemblies are attached outlet and manhole castings. The total weight of the assemblies is in the neighborhood of 25,000 tons.

The bell-and-spigot joint bands are formed by rolling $\frac{5}{16}$ x 10-in. and $\frac{5}{16}$ x 10½-in. bars to the required curvature and closed by butt-welding, using a Lincoln "Shield-Arc" 200-amp. welder and special "Una" rod.

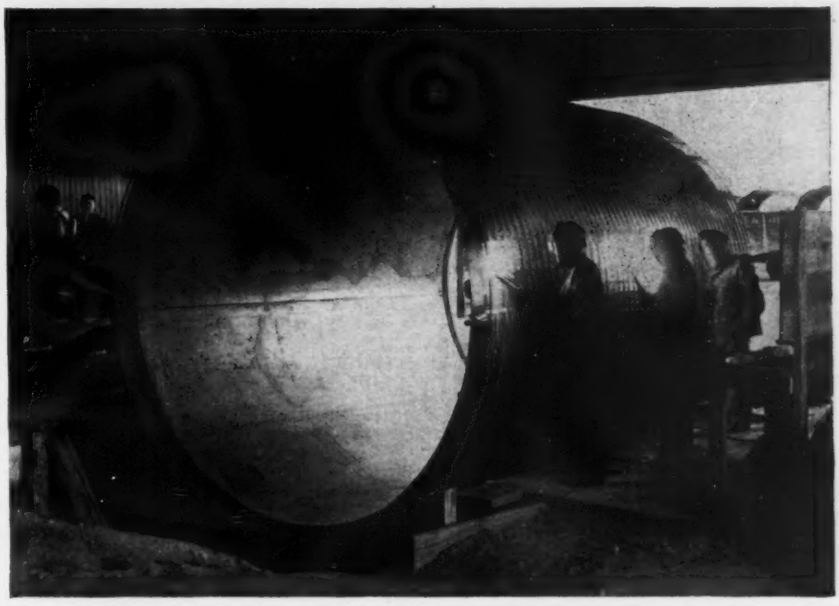
The cylinders are made in two sizes of A.S.T.M.–A-78 steel—(1)

nine 138-in. sheets, each approximately 48 in. wide, and (2) ten 150-in. sheets, each also approximately 48 in. wide. The thickness of these sheets ranges from a No. 10 U. S. steel gage to $\frac{9}{32}$ in. They are sheared to exact size and tack-welded prior to being welded on the longitudinal seams. This latter step is accomplished by two Linde Automatic arc welding machines, using the "Unionmelt" process, operating sixteen hours per day. Each automatic welder is supplied by current from two 500-amp. transformers. During this period about 4,000 ft. of weld, or about 65 per cent of the actual capacity of these machines, is laid. For a No. 10 gage sheet the normal current requirement is 860 amp. at 26 to 30 volts.

After seam welding the required number of sheets they are rolled to the prescribed curvature and a closure made by welding the abutting edges, using a special clamp for holding them together while the bead is laid on with a Lincoln "Shield-Arc" welder. To the shell is then attached the bell-and-spigot bands, after which the hydrostatic test is applied. The bands are gaged from the top carefully at ten points on the circumference and tack-welded there, following which more security for the bands is obtained by tacking at intermediate points around the band.



Bell-and-spigot bands being welded to steel cylinder



Tack-welding circumferential reinforcing rod to longitudinal spacers using G.E. 200-amp. welders and special fluxed rod

Shell Reinforcement

The intricate and important step of attaching reinforcement to the shell follows. Special cage-machines wind two layers of reinforcing rod circumferentially about the shells. The first layer is formed slightly elliptical by using spacers of varying height. The second layer is truly circular and of the same diameter as the long axis of the ellipse. The latter is horizontal when the pipe is laid. This requirement is to prevent distortion under the great dead weight of the pipe. This rod is then tack-welded to longitudinal spacers which, in turn, have been tacked to the shell. G.E. 15-hp., 200-amp. welders and special fluxed $\frac{5}{16}$ rod are used in this operation. One further welding step is necessary for certain shells and this is the welding on of manhole and outlet castings.

With the exception of rolling and welding the bell-and-spigot bands, stretching them to required size, all welding is carried out by the American Concrete & Steel Pipe Company, Los Angeles, Cal., with W. A. Whiting, resident engineer, in charge; the general contractors for the pipe manufacture are the Lock-Joint Pipe Company, Ampere, N. J., with W. R. Brend, resident engineer, in charge. Karl R. Kennison, chief engineer Metropolitan District Commission, is in charge of the engineering work on the project.

The operations of rolling the sheets, testing the shell by hydrostatic pressure, winding the reinforcement on the shells and attaching the bell-and-spigot bands are performed in a building approximately 65 x 300 ft. All handling is done with overhead cranes, of which there are three 10-ton electric travelers. The principal motor-driven machines are listed as follows:

No.	Kinds	Motor Rating; 440 v., 3 phase	Drive	Remarks
1	Shears	20 hp.	Belt	
6	Welders	7½ hp.		G.E.
4	Welders	15 hp.		G.E.
2	Welders	25 hp.		Lincoln
4	Welders	20 hp.		Lincoln
3	Welders	15 hp.		Lincoln
1	Transfer	6 hp.	Gear	
1	Roll	25 hp.	Gear	
2	Cage machines	45 hp. ea.		
1	Pump	15 hp.		
1	Grinder	2 hp.		
2	Compressors	25 hp. ea.		

Modernization of Schuylkill Station Switch-House

Switchgear modernized for superior reliability of station recently superposed — Oil-less breakers, barriers, isolation and rearrangement to ring bus simplify operation and minimize risk of outage — Rapid fault isolation the primary objective *

R. A. HENTZ † **and E. B. SHAW,** ‡ *Philadelphia Electric Company*

SCHUYLKILL STATION is one of the most important steam-electric generating plants in the Philadelphia Electric Company System in that it supplies a large portion of the Philadelphia central business district and most of south and west Philadelphia, areas particularly important from the standpoint of service reliability. The supply of street railway load in these areas is also largely dependent on this station.

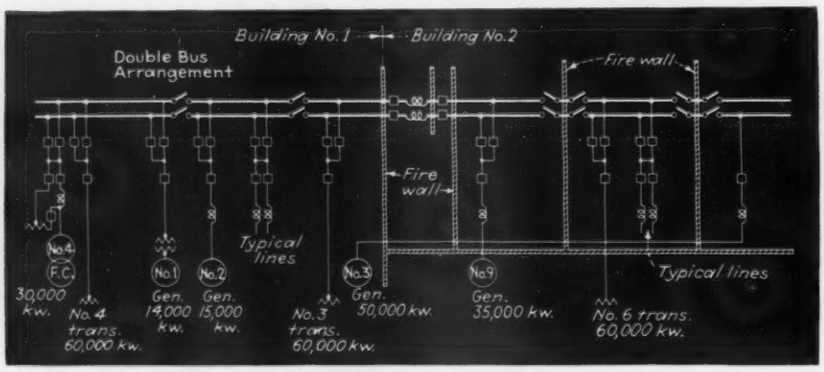
The generating capacity totals 180,000 kw. in seven units, ranging in size from 15,000 kw. to 50,000 kw. Four units totaling 115,000 kw. are 60 cycles; the rest, 25 cycles. There is 52,000 kw. of frequency-changer capacity in four units and three 60,000-kva., 60-cycle transformer banks tie the station into the 66-kv. system.

Prior to 1938 the generating equipment at Schuylkill station had been relegated to peak-load service and the station supply depended primarily on power generated at other stations and transmitted to Schuylkill over two underground and two aerial 66-kv. lines. The transmission supply was not considered sufficiently reliable as the principal source of energy for the important load carried by this station. For this and reasons of capacity and economy a 50,000-kw. high-pressure superposed turbine-generator set was placed in service late in 1938. Having made this forward step in reliability improvement, attention was given to the 13,200-volt switchgear.

The existing arrangement of switchgear consists of a double two-section, 13,200-volt bus, to which the various generators, transformer banks and frequency converters connect, each through one main and two selector oil circuit breakers. From this bus approximately 38 13,200-volt lines supply the 60-cycle load in the Schuylkill station area through both company and customer-owned substations. These lines are grouped in pairs, each line having its own main oil circuit breaker, then connecting through two selector oil circuit breakers in order to supply the paired lines from either of the two buses. This equipment is housed in two buildings. In building No. 1 the switching equipment is not separated from the turbine hall, being mounted on open galleries, nor is it divided into groups by transverse walls. In building No. 2 a wall separates the switching equipment from turbine hall and transverse walls separate the 60-cycle switchgear into three sections, with doors to provide access between sections. Also in building No. 2 two sections of the switch-house are devoted to the supply of three-phase, 25-cycle service to the Philadelphia Rapid Transit Company traction lines in the central, south and west sections of the city, and single-phase, 25-cycle emergency service to the Pennsylvania Railroad electrification.

*Paper to be presented at meeting of E.E.I. electrical equipment committee at Swampscott, Mass., October 9 and 10, 1939.

† Electrical engineer. ‡ Engineer inside plant section.



Existing double 13,200-volt bus with breakers at one sectionalizing point and fire walls in one-half of station

Fault Potentialities Recognized

The normal operating setup for the double two-section bus is to carry all of the load on one of the two buses, leaving the other one de-energized, to be used in the event of trouble on the operating bus. However, an inspection of the cross-section of the switch-house will show that a fault on the operating bus may render the second bus inoperative due to the proximity of the two buses and the absence of any separating barrier between them. Physical limitations precluded the installation of such a wall, which would have been a desirable addition. The existing installation includes a great number of oil circuit breakers next to the bus whose present-day interrupting capacity is not sufficient to interrupt successfully the calculated fault current. These breakers serve to select buses and to back-up the main breakers and are now non-automatic because of this inadequacy. Even though one-half of these switches do not normally carry current, there is the possibility that the failure of an

oil circuit breaker bushing will cause a station interruption.

In the analysis of the fundamental points considered in planning the modernization program attention was given to what may be termed an ideal physical arrangement of equipment for a large switch-house. The points considered to be of prime importance were: (1) Adequate separation of equipment to minimize spread of damage from failures; (2) elimination of flammable materials, particularly transil oil; (3) rapid removal of faults with adequate backup, and (4) an adequate ground network and connections to equipment frames.

Of course, the design of electrical connections must go hand in hand with the physical arrangement of the equipment, but some additional fundamental principles were recognized, such as proper arrangement of duplicate supplies, balanced arrangement of source and supply circuit, simplicity from an operating viewpoint and reduction of short-circuit currents.

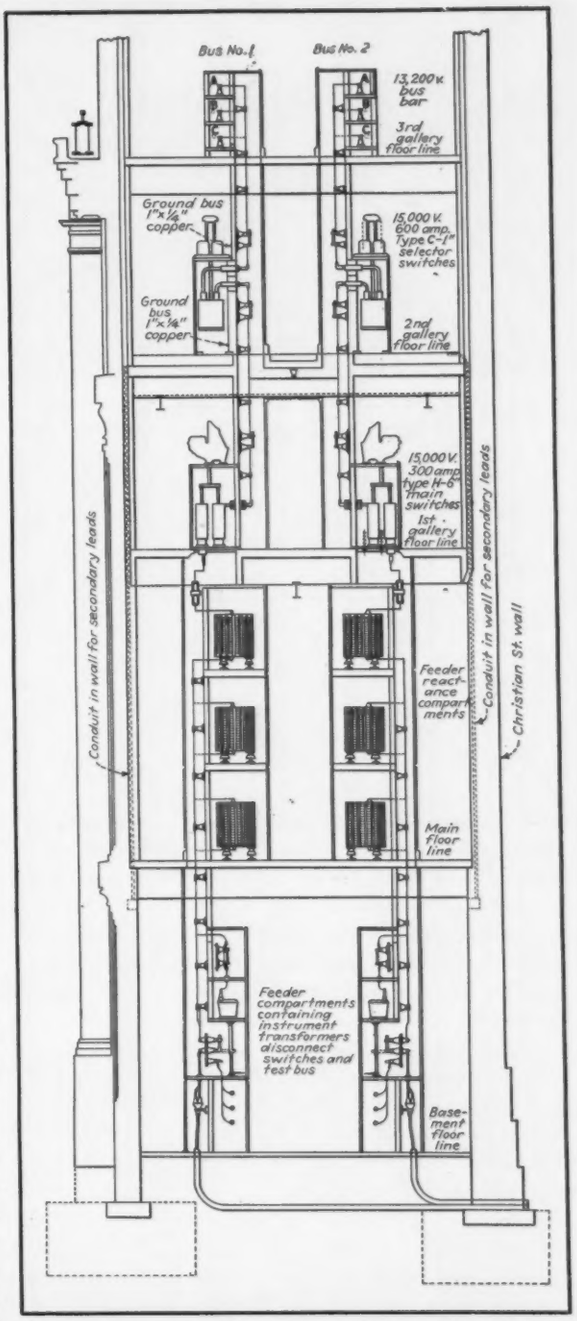
With these principles established, the problem resolved itself into balancing the desirability of providing an ideal switch-house at Schuylkill station against a justifiable cost.

A number of plans were considered whereby the existing switchgear would be either improved or replaced in its present location or new equipment installed in some other location. It appeared that a plan in which the present building and as much as possible of the existing equipment could continue to be used would prove the best to follow.

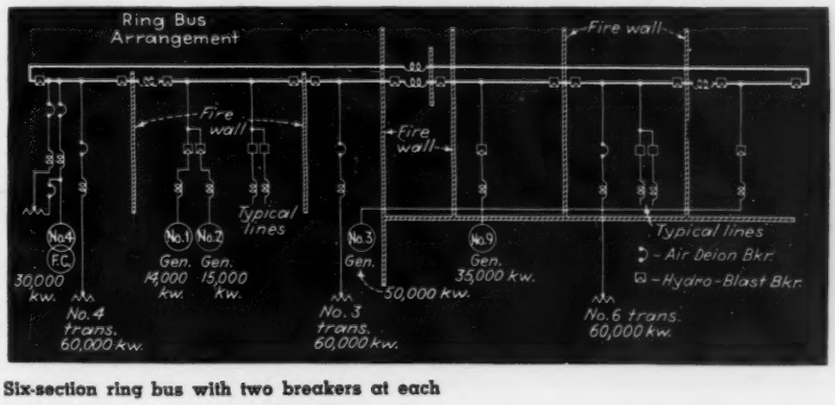
Ring Bus Adopted

An analysis of several electrical connection diagrams indicated that a six-section ring bus was best adapted to the fundamental principles of good switch-house practice. Design and construction are now progressing on this basis. This arrangement permits the supply of the various substation lines from different sections of the bus, and since each substation is provided with a spare line, a proper distribution of these lines among the various sections would result in no loss of load should one section of the bus become faulted. This is true so long as no substation has more supply lines than there are sections of bus at the generating station. In this case only one substation supplied from Schuylkill has seven lines; the others have six or less. The new arrangement of electrical connections is less complex from an operating viewpoint in that each circuit can be connected to only one section of bus, thus eliminating complicated arrangements of selective devices which may be confusing in times of emergency.

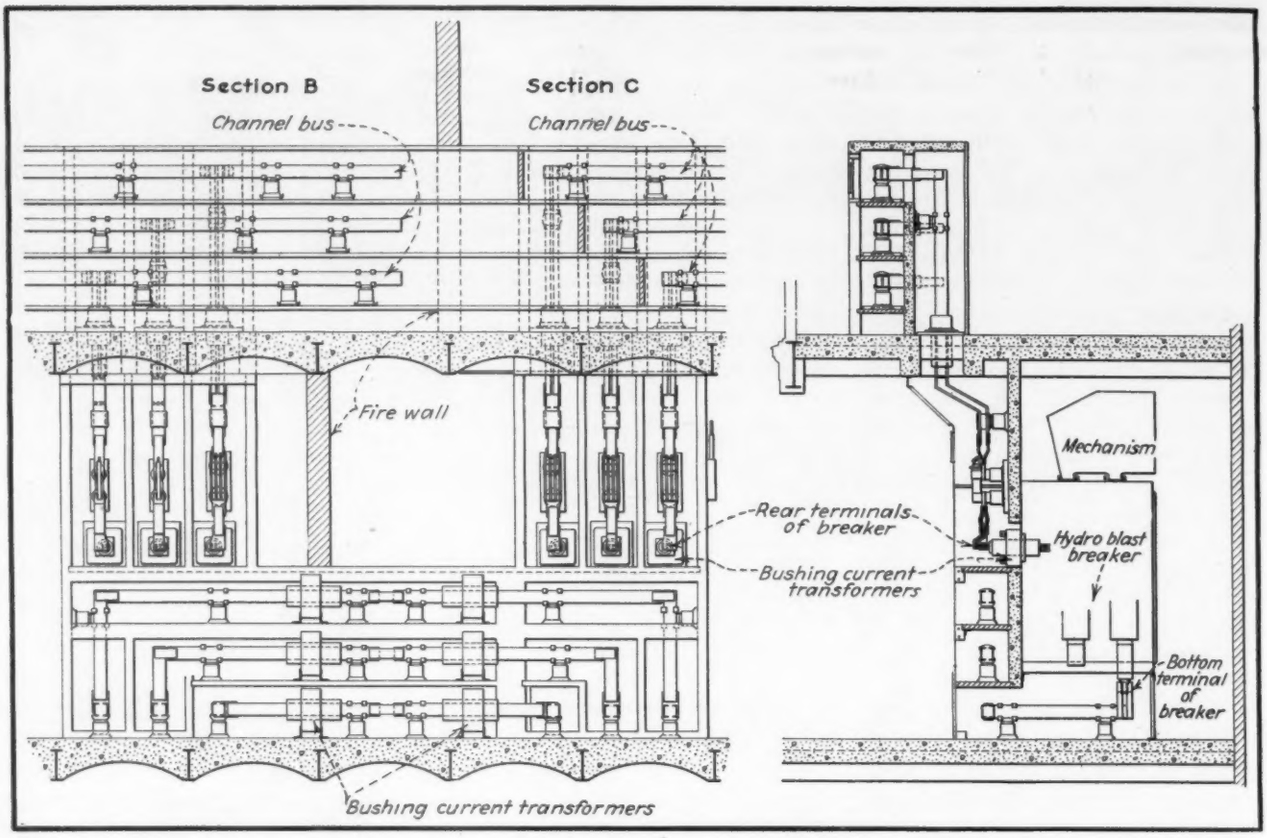
So far as physical segregation of the equipment is concerned, the present arrangement in building No. 2 appeared to be satisfactory, particularly since the existing transverse fire walls in this building are properly located to permit new sectionalizing equipment to be installed at these points. Since no fire walls exist in building No. 1, it is a simple matter properly to locate the new walls with respect to the sectionalizing locations. It is recognized that a fire wall in which doors are provided for access between sections is not complete assurance that trouble will not communicate between sections through the swinging doors. Consideration was given to making these walls solid and provid-


Bus No. 1
Bus No. 2
13,200 V. bus bar
3rd gallery floor line
Ground bus 1"×⅛" copper
15,000 V. 600 amp. Type C-1" selector switches
Ground bus 1"×¼" copper
2nd gallery floor line
15,000 V. 300 amp. type H-6 main switches
1st gallery floor line
Conduit in wall for secondary leads
Conduit in wall for secondary leads
Christian St. wall
Feeder reactance compartments
Main floor line
Feeder compartments containing instrument transformers disconnect switches and test bus
Basement floor line

Cross-section of typical outgoing line compartments with existing double bus construction



Six-section ring bus with two breakers at each sectionalizing point and additional fire walls



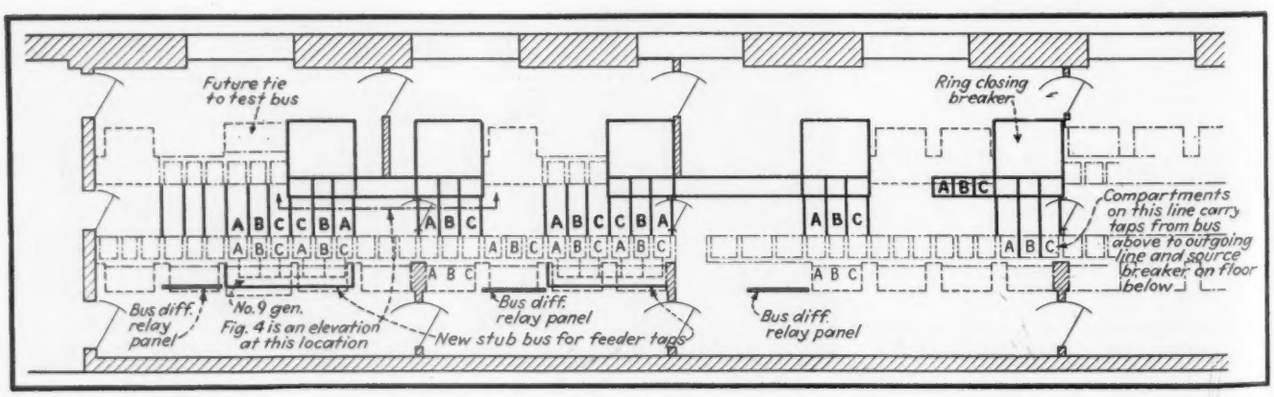
Typical arrangement of sectionalizing breakers on the floor below the bus. Bushing current transformers are mounted on rear terminals of breakers and in the connecting structure between breaker compartments

ing access by means of balconies overhanging the street on one side and the turbine hall on the other. However, physical difficulties and cost made this impracticable and it was decided to continue with the doors because it was considered that the elimination of oil in the circuit breakers would reduce the probability of explosive pressures being developed. The physical arrangement of new equipment is shown in accompanying illustrations.

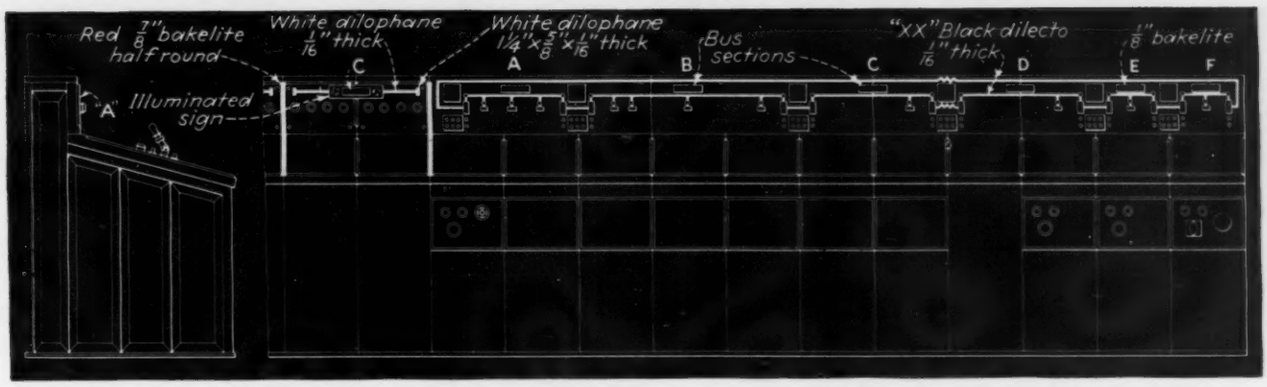
In order to simplify the switchboard operation for the ring bus scheme a mimic bus is being installed on the vertical section of the benchboard in building No. 1 control room. All of the 60-cycle sources (*i.e.*, generators, transformer banks and frequency converters), as well as the outgoing lines in building No. 1, are controlled from the operating room in this building. The 60-cycle lines located in building No. 2 and all 25-cycle equipment are controlled from the operating room in building No. 2.

All of the 60-cycle sources and bus sectionalizing equipment will be grouped at one end of the building No. 1 control board, arranged in the same sequence as on the main bus. The twelve sectionalizing breakers will be controlled by telephone type switches mounted on steel panels in the mimic bus. These are properly located with respect to the source panels on the sloping section of the board so that a complete picture of the position of the important breakers can be seen by the operator at a glance. Indicating lamps in the mimic bus will show the closed position of the source breakers.

While experience has shown that damage can be caused in a switchhouse from other than oil fires, removal of the oil hazard is an important step in the direction of minimizing spread of damage. Ac-


Future tie to test bus
Ring closing breaker
A B C C B A
A B C
A B C C B A
A B C
A B C
A B C
Compartments on this line carry taps from bus above to outgoing line and source breaker on floor below
Bus diff. relay panel
No. 9 gen.
Fig. 4 is an elevation at this location
Bus diff. relay panel
New stub bus for feeder taps
Bus diff. relay panel

Plan showing location of sectionalizing breakers in one-half of station



Control benchboard in building No. 1 with mimic bus showing 60-cycle sources and bus section sectionalizing equipment. Outgoing lines are grouped for the respective bus sections on panels not included in mimic bus

cordingly, the circuit breakers, of interrupting capacities ranging from 500,000 to 1,500,000 kva., required by the ring bus scheme, were specified to be of an oil-less type. All twelve of the bus sectionalizing breakers as well as those connecting the generators to the bus will be of the General Electric Company Hydroblast type and the breakers on the three bus tie transformer banks and the 25- and 60-cycle ends of the 30,000-kw. frequency converter will be of the Westinghouse Electric & Manufacturing Company air De-ion type. On the outgoing lines General Electric Company type FH oil breakers will remain, though consideration is being given to modernizing them to the Hydroblast type. If it is decided to do this, all of the 60-cycle circuit breakers in Schuylkill station switchhouse will be of an oil-less type.

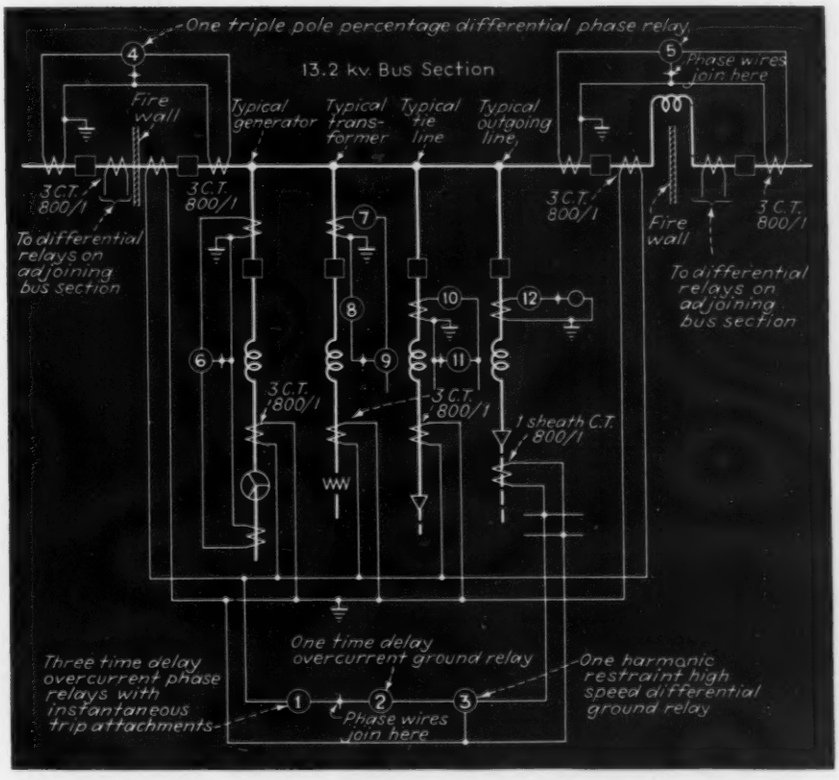
Calculated fault currents for the ring bus scheme indicated that breaker duties would be appreciably increased, so reactors are being installed on the large bus tie transformer banks and on the 30,000-kw. frequency converter in order to reduce the short-circuit currents. Reactors were already provided on the other source circuits and at two locations in the buses. Provision is being made for the future installation of reactors at two additional sectionalizing points in the main bus.

Rapid Isolation of Faults

Rapid isolation of faults with adequate backup protection is an essential feature of the ring bus scheme if spread of trouble is to be reduced to a minimum. A great deal of attention has been given to this phase of the problem in order that faults would be detected accurately and quickly. It was realized at the outset that the selection and wiring of the relays was not the entire problem because improperly designed current transformers could nullify the best relay scheme by failing to reproduce faithfully the proper ratio of fault current on the secondary side. The deeper this problem was explored the more evident it became that very special attention would be required by both the manufacturer and user of this device to prevent saturation by the d.c. transient of the short-circuit current, which in this station has a relatively long time constant. The source current transformers selected are as large as can be physically accommodated in the compartments. The design of the current transformers includes a sufficient amount of iron to prevent saturation within the time required to clear all types of faults in various locations. As a check, exhaustive tests will be made on the current transformers and relays in an equivalent setup in the laboratory.

The fundamental principles of the differential and back-up overcurrent protection for a typical bus section and also the differential protection of the tie sections are shown in an accompanying illustration. The latter sections will be protected by three-element percentage differential relays. The differential protection of each bus section employs two sets of relays which may be described as a

[*Continued on page* 120]


One triple pole percentage differential phase relay
13.2 kv. Bus Section
Phase wires join here
Fire wall
Typical generator
Typical transformer
Typical tie line
Typical outgoing line
3 C.T. 800/1
To differential relays on adjoining bus section
1 sheath C.T. 800/1
Three time delay overcurrent phase relays with instantaneous trip attachments
One time delay overcurrent ground relay
One harmonic restraint high speed differential ground relay
Phase wires join here

Relay protection for typical section of 13,200-volt ring bus

Merchandising for Municipalities Develops New Residential Markets

$700,000 E.A.R. results from Georgia Power plan — All sales facilities of utility allocated to cities purchasing power — New load sold to municipal customers totals 24,000,000 kw.-hr. per year

E. C. HAMMOND, *Supervisor, Wholesale Towns, Georgia Power Co., Atlanta*

IN COMMON with many other utility companies, Georgia Power Company renders electric service at wholesale to municipalities. By sending its residential salesmen and home economists into twenty of these towns the company has gained $200,259 and the municipalities $565,835 in new revenue per year from annual sales of 24,186,550 kw.-hr.

When the plan was launched, three years ago, the company supplied electric service at retail to more than 500 cities, towns and communities in an area comprising approximately three-fourths of the state of Georgia. In this territory were 41 towns, with a total of approximately 25,000 customers, to which electrical energy was sold to the municipalities under wholesale power contracts and the cities distributed the current to their citizens over their own retail distribution systems. These towns were known by the company as "wholesale towns."

With the exception of the larger cities, most of which were served at retail by the company, many of these wholesale towns were among the largest, most progressive and enterprising in the state. Notwithstanding this fact, the electrical consumption of customers in these towns was considerably below that of customers in comparable towns served by the utility and little or no effort was being made by the municipal authorities to increase the consumption. The absence of promotional effort on the part of the municipalities was due generally to failure on the part of city officials to appreciate the possibilities of new-business activities. In those instances where the officials did recognize the value of promotional effort they were handicapped by insufficient personnel and a lack of knowledge as to how to develop new business.

Early in 1936 Charles A. Collier, vice-president of the company, realized that because of the absence of previous promotional activities these wholesale towns represented fertile fields for developing the use of electricity and that, with the co-operation of the city officials, power company representatives could do an outstanding load-building job in these towns. Here appeared to be an opportunity not only to increase the company's revenue by increased sales to the municipality, but also increase materially the municipalities' revenues from sale of current and thus deserve the whole-hearted goodwill of the citizens and officials of these towns. The result was the company's Wholesale Town Co-operative Load Building Plan, which was launched in August, 1936.

City of Moultrie, Ga., sells power, bought from utility, to local residents. Utility employees take over appliance sales and promotion, arrange for dealer displays and conduct these cooking schools

New-Business Department

Under this plan the company offers, in effect, to provide those wholesale municipalities desiring to co-operate, with a new-business department which will do substantially everything in a load-building way for the municipality that the company's representatives do in developing load in those towns served by the utility at retail. This new-business department consists of a sales representative and a home economist, whose salaries and expenses are paid by the utility. These representatives make their homes in the wholesale town or towns to which they are assigned and devote their efforts to building load in these towns.

Briefly, the duties of the sales

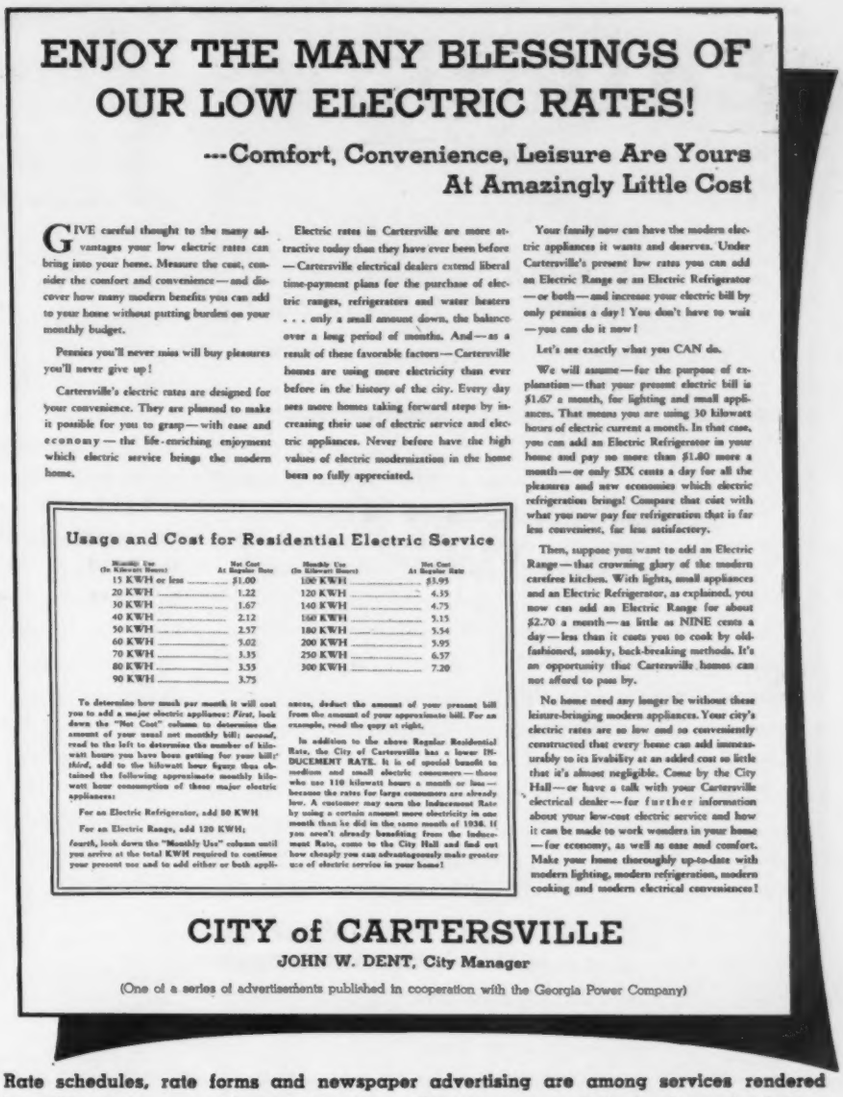
representatives are to work with the local merchandise dealers in promoting the sale of major appliances and to solicit commercial lighting and power load. In working with the dealers, the sales representative helps them obtain lines of merchandise, train salesmen, conduct cooking schools, lighting schools and other activities designed to promote the sale of electrical appliances and endeavors to keep them aggressively soliciting business at all times. In addition, the sales representative constantly makes calls with the dealers' salesmen in an effort to close sales. In soliciting commercial and industrial lighting and power business, the sales representative acts in the dual capacity of a lighting and power salesman soliciting new business in these fields and making layouts and writing specifications.

Home Economist Follows Up

The home economist assigned to a municipality follows up all major appliances sold by dealers in order to be sure that the customers are thoroughly instructed in the proper uses of the appliances and that the appliances are satisfactory in every respect. In addition she lectures on lighting before women's clubs and civic organizations. She also calls on the customers in their homes in order to discuss their lighting and make recommendations for improving it.

In addition to the above, the company also offers to co-operate with the municipalities from time to time in advertising campaigns designed to increase the use of electricity. In this connection the company offers to prepare all ads for the city and to pay part of the space cost of running the ads in the local papers.

In return for these services the city agrees to provide office facilities, usually in the City Hall, for the new-business representatives and to co-operate with them fully in all their new business activities. As a prerequisite to the plan's success, the residential and commercial rates of the city must be of promotional types which are conducive to success of the load-building program. The utility has been requested by several municipalities, looking to inauguration of the plan, to make rate studies and recommend suitable rates, which were immediately placed in effect. In many other instances the utility has been called on by the municipalities



ENJOY THE MANY BLESSINGS OF OUR LOW ELECTRIC RATES!

---Comfort, Convenience, Leisure Are Yours At Amazingly Little Cost

GIVE careful thought to the many advantages your low electric rates can bring into your home. Measure the cost, consider the comfort and convenience—and discover how many modern benefits you can add to your home without putting burden on your monthly budget.

Pennies you'll never miss will buy pleasures you'll never give up!

Cartersville's electric rates are designed for your convenience. They are planned to make it possible for you to grasp—with ease and economy—the life-enriching enjoyment which electric service brings the modern home.

Electric rates in Cartersville are more attractive today than they have ever been before—Cartersville electrical dealers extend liberal time-payment plans for the purchase of electric ranges, refrigerators and water heaters . . . only a small amount down, the balance over a long period of months. And—as a result of these favorable factors—Cartersville homes are using more electricity than ever before in the history of the city. Every day sees more homes taking forward steps by increasing their use of electric service and electric appliances. Never before have the high values of electric modernization in the home been so fully appreciated.

Your family now can have the modern electric appliances it wants and deserves. Under Cartersville's present low rates you can add an Electric Range or an Electric Refrigerator—or both—and increase your electric bill by only pennies a day! You don't have to wait—you can do it now!

Let's see exactly what you CAN do.

We will assume—for the purpose of explanation—that your present electric bill is $1.67 a month, for lighting and small appliances. That means you are using 30 kilowatt hours of electric current a month. In that case, you can add an Electric Refrigerator in your home and pay no more than $1.80 more a month—or only SIX cents a day for all the pleasures and new economies which electric refrigeration brings! Compare that cost with what you now pay for refrigeration that is far less convenient, far less satisfactory.

Then, suppose you want to add an Electric Range—that crowning glory of the modern carefree kitchen. With lights, small appliances and an Electric Refrigerator, as explained, you now can add an Electric Range for about $2.70 a month—as little as NINE cents a day—less than it costs you to cook by old-fashioned, smoky, back-breaking methods. It's an opportunity that Cartersville homes can not afford to pass by.

No home need any longer be without these leisure-bringing modern appliances. Your city's electric rates are so low and so conveniently constructed that every home can add immeasurably to its livability at an added cost so little that it's almost negligible. Come by the City Hall—or have a talk with your Cartersville electrical dealer—for further information about your low-cost electric service and how it can be made to work wonders in your home—for economy, as well as ease and comfort. Make your home thoroughly up-to-date with modern lighting, modern refrigeration, modern cooking and modern electrical conveniences!

Usage and Cost for Residential Electric Service

Monthly Use (In Kilowatt Hours)	Net Cost At Regular Rate
15 KWH or less	$1.00
20 KWH	1.22
30 KWH	1.67
40 KWH	2.12
50 KWH	2.57
60 KWH	3.02
70 KWH	3.35
80 KWH	3.55
90 KWH	3.75
100 KWH	$3.95
120 KWH	4.35
140 KWH	4.75
160 KWH	5.15
180 KWH	5.54
200 KWH	5.95
250 KWH	6.57
300 KWH	7.20

To determine how much per month it will cost you to add a major electric appliance: *First*, look down the "Net Cost" column to determine the amount of your usual net monthly bill; *second*, read to the left to determine the number of kilowatt hours you have been getting for your bill; *third*, add to the kilowatt hour figure thus obtained the following approximate monthly kilowatt hour consumption of these major electric appliances:

For an Electric Refrigerator, add 50 KWH

For an Electric Range, add 120 KWH;

fourth, look down the "Monthly Use" column until you arrive at the total KWH required to continue your present use and to add either or both appliances, deduct the amount of your present bill from the amount of your approximate bill. For an example, read the copy at right.

In addition to the above Regular Residential Rate, the City of Cartersville has a lower INDUCEMENT RATE. It is of special benefit to medium and small electric consumers—those who use 110 kilowatt hours a month or less—because the rates for large consumers are already low. A customer may earn the Inducement Rate by using a certain amount more electricity in one month than he did in the same month of 1938. If you aren't already benefiting from the Inducement Rate, come to the City Hall and find out how cheaply you can advantageously make greater use of electric service in your home!

CITY of CARTERSVILLE

JOHN W. DENT, City Manager

(One of a series of advertisements published in cooperation with the Georgia Power Company)

Rate schedules, rate forms and newspaper advertising are among services rendered by utility in towns purchasing its power. Power company tie-in is shown by bottom line of type

from time to time, after the plan has been placed in effect, to make rate studies and recommendations effecting further reductions.

In presenting the plan to the municipal officials, it has been presented by the utility as a straight business proposition—a co-operative plan which will enable both the utility and the municipality to make more money. In accepting the plan, no papers are signed by either party, it is simply a verbal agreement subject to immediate cancellation by either the utility or municipality whenever either may desire to do so. As evidence of the satisfaction resulting from the application of the plan, it has now been placed in effect in more than twenty towns, and in no instance has either party canceled the agreement. The towns in which the plan is now working are among the largest of the 41 towns served wholesale and vary in size from 2,000 to 20,000 population. At the present time the utility has ten full-time sales representatives and the equivalent of five full-time home economists working in these towns.

Co-operative Advertising

In almost every instance where the plan has been placed in effect it has been launched by a large co-operative advertising campaign run in the local papers over a six- or eight-week period. These ads, which are prepared by the utility for the municipalities, are designed to sell (1) the attractiveness of the local rates, which have usually just been placed in effect; (2) the advantages of the various major electrical appliances and good lighting, and (3) the opportunity afforded by the local rates for enjoyment of these advantages. Those

[*Continued on page* 124]

Editorials

S. B. WILLIAMS, *Editor*

America Does Not Want War

THIS WEEK our Congress meets for the purpose of reconsideration of the Neutrality Act, but in reality what it does will in a measure determine the ease or difficulty with which this country may be dragged into the new European war.

Wars for the most part are brought about to save face. A nation's leaders go so far that they cannot back down without loss of prestige to the nation and loss of power at home.

Let us make no mistake at Washington during this session that may cause us to enter some one else's battle. America does not want war. It hasn't gotten through paying for the last one.

Our entrance into the last war, besides costing us great human suffering and sacrifice, besides wasting vast sums not yet paid off, finally deprived us of many of our cherished rights and social prerogatives.

Wars bring great economic and social upheavals, resulting in the further regimentation of capital and labor. Freedom to work, freedom to talk, freedom to worship, freedom to live as we please—these are cherished American customs. We must not jeopardize them by entering a war remote from our own borders, where we have nothing to gain and much to lose, just to save face.

We entered the last war to save democracy, but the ultimate outcome was greater restriction to business and to the individual. Our manufacturers, our business men, our utilities and all of those who work for them want to preserve the principles of democracy in this country, want to continue to encourage private initiative, want to remain free from an increasing burden of restrictive legislation. Let us tell Congress in terms that admit of no equivocation that however the neutrality act might be modified or altered, no policy must be set up or pronouncement made that later might cause us to go to war merely to save face.

Competitive Power Advertising

"COMPETITIVE power supply may be a source of worry to other companies, but it does not bother us." That was the attitude taken by more than a few electric utility executives when effort was made a couple of years ago to get started a national program of central station power advertising.

That attitude tabled the effort then, but in the meantime the advertising of competitive power in business, trade and technical journals that reach practically every central station industrial customer goes right on. In the first six months of 1939 forty or more manufacturers of competitive power equipment used 600 pages of advertising in sixty papers.

The sixty papers surveyed do not by any means include all that are published in the business paper field, nationally and regionally. It is reasonable to assume that in the entire field the total number of pages of competitive power advertising would be 50 or even 100 per cent more than the figure stated above. And, also, it would not be unreasonable to double the six months' figure to reach the annual one. Thus, one may say that while the utilities do nothing at all to advertise their industrial power service nationally, their competitors will use from 1,500 to 2,500 pages of national advertising to reach utility customers this year.

There are some who were opposed to the program in the beginning who now think that this would be a good time to resurrect the idea of national power advertising. If the idea has any virtue or value, the sooner it is awakened the better for the electric utilities.

Public Relations Aspect of Private Sales of Utility Issues

"PUBLIC UTILITY BONDS continue to offer one of the safest and most attractive investments for savings bank funds." These are the opening words of the report of the public utilities committee of the Savings Bank Association of Massachusetts.

The report, while not criticising, does call attention to the private sales of large utility issues which limit the bond-buying opportunities of savings banks. For certain apparently good reasons private placement of issues appeals quite strongly to utility managements. But is it not possible, even probable, that in this case insufficient weight is being given to the long-range advantage as against the immediate advantage and lesser difficulties of private sales?

Savings banks, being repositories of the thrift of the masses, are perhaps thereby entitled to have as many utility bonds as they want. There is a valuable public relations side to savings bank holdings. About investment operations of the big insurance companies, in spite of their millions of policy-holders, there is an aura of "high finance" extremely vulnerable to political attack and soap box oratory. Perhaps there is a "Stop, Look, Listen" sign around here somewhere.

No Room for Complacency

IS THE electric light and power industry again becoming self-satisfied? Is it repeating its one great fault of the pre-depression era?

Speaking before the recent Pennsylvania Electric Association convention, E. C. Stone, vice-president and general manager of the Duquesne Light Company, said:

"Perhaps the greatest danger confronting our industry at the present time is the possibility of too much self-complacency. We have come to feel not only that, except under special limited conditions, we can offer the most economical and most reliable power supply that can be obtained, but also that we are doing everything practicable to provide a perfect service to our customers."

There is no doubt in the minds of the people of this industry that it is offering the most economical and most reliable power supply and that it is doing everything practical to provide as near a perfect service as possible. If industry thinking were to stop there and if men's minds were to be closed to any endeavor to improve the service or lower the cost, then a charge of complacency would be justified.

All of our past experience has taught us that each year the cost of electric service is less and the quality improved. Is this going to stop? No, we are going to continue to lower rates and improve reliability. The pressure for reduced rates is going to continue, both inside and outside the industry, and all thought of the future must take this fact into consideration.

Our service is not perfect, nor is it always as good as we can make it. Engineers in the employ of manufacturers, as well as utilities, are constantly working to improve equipment and methods. Why? Because there is room for improvement, and probably always will be.

Our service cannot be called perfect so long as we have major breakdowns or outages, so long as we have large numbers of unserved customers or minimum-use customers, so long as millions of customers are prevented from taking more service either because of cost or inadequate wiring, so long as our employees fail to render the best human service to customers.

Electric service is not only one of supplying kilowatt-hours. It is also doing everything possible to help the customers get all the conveniences of the service. It is also making sure that the customer's contacts with the company and its representatives are pleasant, be it collections, sales, new service, changeover or repairs.

Nor is our service the most economical, so long as a substantial number of our customers feel that they cannot afford to buy more of it. The economy of electric service lies not alone in the rate, but in the over-all economy of the service. Will it help the domestic economy, or increase the merchant's sales, or accelerate the production of the manufacturer? There are customer benefits—economies—that often far outweigh any element of price for energy.

No matter how much progress has been made by the industry so far, and it has been plenty; no matter how good we think we are, and the results in comparison with other businesses are some justification for pride, there can never be any room for self-satisfaction, complacency, so long as we have the technical, sales and public relations job, as outlined, ahead of us.

Capitalization of Range Wiring Subsidies Not Permitted

ONE after another, state commissions are disallowing the capitalization of range wiring subsidies on the grounds that they are discriminatory to other users of the service and do not represent an investment against which securities may be issued. This is not a new determination, for as long ago as 1932 a study disclosed but two commissions, Oregon and Virginia, that allowed the capitalization of such subsidies.

The matter has come to a head in the last year or so because of the volume of free wiring allowed by utilities in the promotion of electric range sales. How was this expense to be charged? Several companies argued that since this free wiring was just as necessary to get a customer to use a range as service wires are to enable a customer to take the service, it was a just capital expense and should be so treated.

The latest commission to rule in this connection is the Massachusetts Department of Public Utilities in the petition of Brockton Edison. Following its past decisions, this commission not only denied the company the right to capitalize this expense but even to take it out of operating expense. Such expenses in Massachusetts must be charged to merchandising and any loss therefrom is charged against the stockholder by deduction from surplus.

The decisions of the commissions against allowing these subsidies as an investment charge either for purposes of capitalization or rate making is sound, although there might be some debate on the disallowance of the charge as an operating expense. It is conceivable that if such charges were capitalized the companies might be accepting the right of the commissions to require free wiring not only for ranges but for other devices, and conceivably for other than residential customers.

The present trend is to discontinue these subsidies, and undoubtedly these decisions will accelerate the trend. However, these subsidies served their purpose at the time. Without them range sales would have continued at a low level. In the meantime, range sales have increased and the cost of range wiring has been materially reduced. In a great many places range wiring is now down to the point where it should be no great deterrent to sales.

This does not mean, however, that the necessity for promoting range sales has passed. There is now probably more need than ever to overcome whatever advantage was derived from free wiring. Subsidies at their best are but temporary measures for quick results. For the long pull nothing yet has been able to take the place of strong selling and forceful promotion.

Remember?

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

INSIDERS in the Administration figure that the war in Europe will last from four to five years—and that the United States will become involved well within a year. In fact, there is much talk, behind closed doors, of April. It is rather curious that April has seen the start of activity in every war in which this country has played a part.

'Twas the 18th of April, in '75,
Hardly a man is now alive
Who remembers that famous day and year.

Remember?

Well, the war of 1812 started in April. So did the Mexican war. Fort Sumter was fired on in April. Congress decided to "remember the Maine" in April. And the declaration of war against Germany came in April, 1917.

With this feeling running all through the Administration, manifested by frank talks by individual officials—never for quotation, of course—one would think certain things would be done, by way of preparedness. And one would be right, in part. It is the other part which is mystifying.

Wolves in Sheep's Clothing

The "right" part is that enlistments in the army and navy are going forward. The marine corps is having its strength increased by 25,000 men. One hundred and sixteen world war destroyers are being taken out of grease, so to speak, and put in condition. So are the hundred-odd Hog Island ships, no use for peace-time trade, economically, but a hedge against the day when submarines may make shipping vital to supply lines.

On the other hand, one shudders to think of the plans labeled as preparedness or war measures which may blossom forth from an Administration so committed to public ownership. The power shortage bogey man, which certain Washington officials like to bring out every so often, can start some very funny suggestions.

Since coal shortage was behind much of the power problem of the World War, preparedness might bring a demand for more water power in the industrial areas. Or we might have urged upon us with much flag waving government-owned steam plants supplementing private operation, or all kinds of interconnection with mixed ownership. Or any one of a dozen things which on the surface look like good preparedness measures, but which underneath are subtly calculated to achieve other ends so far denied by Congress and public opinion.

There were plenty of instances during the World War when projects failed to do the things the public was told they would do. Many of these projects, however, were most successful, from their advocates' point of view, in achieving the things they personally were fighting for, but could not then openly secure.

Fortunately for the Administration itself, in the long run Congress will be tough with any proposals to expand government power projects during this rush to get ready for war. Plenty of men now sitting in Congress remember some of the war policies of 1917, and most of them, with the exception of George W. Norris, deplore their results.

Alaskan Railway

Remember the Alaskan Railway, built right during the World War at a cost of $50,000,000? It's been losing a million a year on operation ever since, counting nothing for interest on investment. But did you remember that a 37-mile spur was built off that railroad to open up a coal field? There was a shortage of coal during the World War. But when the spur was opened, the then Secretary of the Navy, under whom Franklin D. Roosevelt was then serving as assistant, closed the coal field as a naval reserve, though it was obvious even before that time that no new naval vessel would ever be built again to burn coal.

Remember Muscle Shoals? If you are in the electric industry, you ought to, because if it had not been for a so-called wartime emergency, that power plant to make nitrates for explosives would never have been built and we might have escaped TVA.

Not knowing anything about it, one might say now: "Thank heaven we built that nitrate plant back in those days. If we do get into a war it will come in mighty handy now." But the facts are that No. 1 nitrate plant at Muscle Shoals never was any good and never will be. No. 2 nitrate plant at Muscle Shoals is kept in operating condition by specific direction of Congress.

Muscle Shoals

But any well-informed ordnance officer in the army or navy will tell you, and not hesitate or do any speculating about it, that No. 2 nitrate plant, kept in operation by this direction of Congress for all these years, *will not be used even if the U. S. gets into the war.*

As a national defense move, Muscle Shoals was and is on a par with that armor plate plant in West Virginia which has never produced a pound of armor, and even below the Alaskan Railroad, which was built to keep the wicked Guggenheims from exploiting Alaska.

Congress is not swallowing Administration measures whole, these days. Too many of them remember the last war. Too many of them are thinking about the presidential campaign which will get under way in just a few months now. Too many of them are hoping to prevent either Mr. Roosevelt or any one he may choose from getting the Democratic nomination. It will not be enough for them that the White House may insist that this or that is necessary for national defense. Even if and when the U. S. gets into the war, as the Administration expects, Congress will be mighty chary about war powers—and about their termination when the emergency has passed.

NEWS OF THE WEEK

New Power Plant Planned by Narragansett Electric

Providence station to have 40,000-kw. unit — Prospect of war conditions and high usage of electricity prompts immediate action in $4,000,000 construction program — New output record

Work on the installation of a 40,000-kw. generating unit in the Manchester Street station of the Narragansett Electric Co. at Providence will start immediately, according to Frank D. Comerford, chairman of New England Power Association, parent company.

Mr. Comerford said that the installation will cost over $4,000,000 and will be the initial step in a program, under study by system engineers, to provide an increase in the generating capacity.

New Output Peak

The decision to start work at once was made, Mr. Comerford said, because of the prospect of war conditions in industry and because of the unusually high usage of electricity on the part of the system's 631,589 customers in recent weeks. On September 13 primary production of New England Power Association subsidiaries, which supply electricity to industrial and domestic customers in five of the six New England states, reached 8,000,000 kw.-hr. for the first time in history. This figure excludes sales made to Boston Edison Co.

"It is significant, as well as surprising, that this new figure should be established in September," Mr. Comerford said. "Past production highs of the system were always made in November and December, when shorter daylight periods contributed greatly to the increase."

The expansion of power facilities is in line with the program as urged to electric utilities by the War Department.

United Engineers & Constructors, Inc., of Philadelphia have been awarded the contract for the design and construction of the new addition at Manchester Street. Combustion Engineering Co. will supply the boiler of 430,000 pound capacity and the 40,000-kw. turbo-generator will be built by General Electric Co.

When the installation is completed, the capacity of Manchester Street station will be approximately 60,000 kw. Since there is already in operation a 140,000-kw. plant at the South Street station, Narragansett Electric will have a total capacity of around 200,000 kw. early in 1941, when the new job is completed.

The Providence expansion was first under consideration in 1937.

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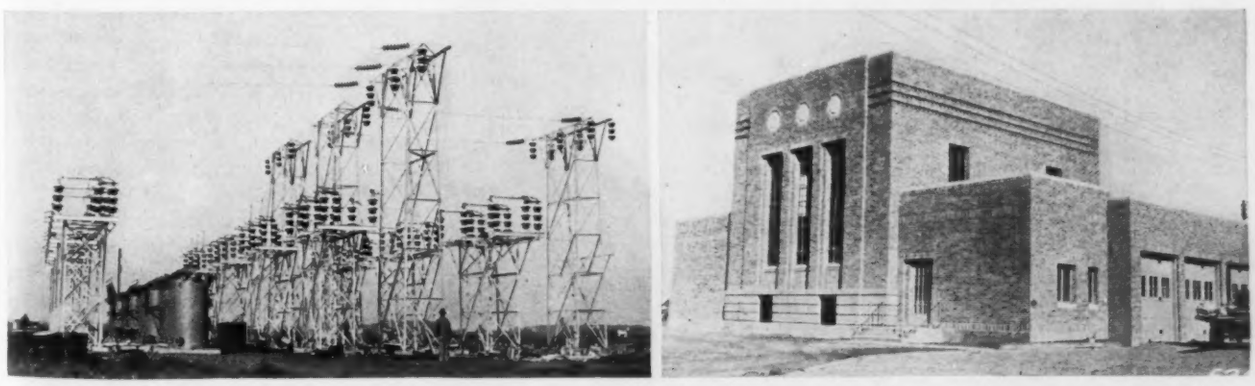
Puerto Rico Takes Action Against Utility Plant

The Puerto Rican Government has brought condemnation proceedings to acquire the Rio Blanco hydro-electric plant of the Puerto Rico Railway Light & Power Co. According to the government, it was purchasable on September 12 under the terms of its franchise.

It is the contention of the company that the end of the ten-year period when the plant may be acquired is still some months off. It also asks $1,073,000 for the property. The government offered $936,000. The Rio Blanco plant is part of a large system owned by the Puerto Rico Railway Light & Power Co., a subsidiary of International Power Co., a Canadian company.



NEBRASKA "TVA"—The switchyard and control house of the North Platte Public Power District which is the terminal station for the 110-kv. and the 39-kv. lines of the "Little TVA" in Nebraska

San Francisco Wins

Court of Appeals reverses decision that city violated Raker Act

San Francisco's right to dispose of power generated on its Hetch Hetchy water project through an agency agreement with Pacific Gas & Electric Co. was upheld in a U. S. Circuit Court of Appeals decision handed down September 13. The decision reverses a U. S. District Court ruling under which the city had been found in violation of provisions of the Raker Act, had been ordered to dissolve the agreement and had been enjoined from disposing of its power.

The suit had been brought initially by the United States government at the instigation of Secretary of the Interior Ickes. United States attorneys who prosecuted the case have indicated that they will ask the Supreme Court for a writ of review.

The government's attack on the power disposal agreement, which brings the city $2,000,000 in revenues annually, had been based upon provisions of the Raker Act which granted San Francisco certain water and power rights in Yosemite National Park for purely municipal purposes.

The decision holds that the government's contention that the act prohibits the city from disposing of its power through the Pacific Gas & Electric Co. as its agent is without merit. The court shows that the Raker Act contains nothing with reference to the construction or acquisition of municipal water or power distribution facilities. It holds that the agency agreement is not to be construed as a sale of the power, but is purely an agency contract both in intent and in fact.

Since 1927 the provisions of the Raker Act now defined by the court have been used as a reason for submitting municipal power distribution to the voters of San Francisco in eight elections. In every instance the proposals were defeated, the last time by a vote of 2.5 to 1 in May of this year.

In Washington, Secretary Ickes said that an appeal would be made to the Supreme Court.

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Novel Demonstration Aids Sale of Pumps

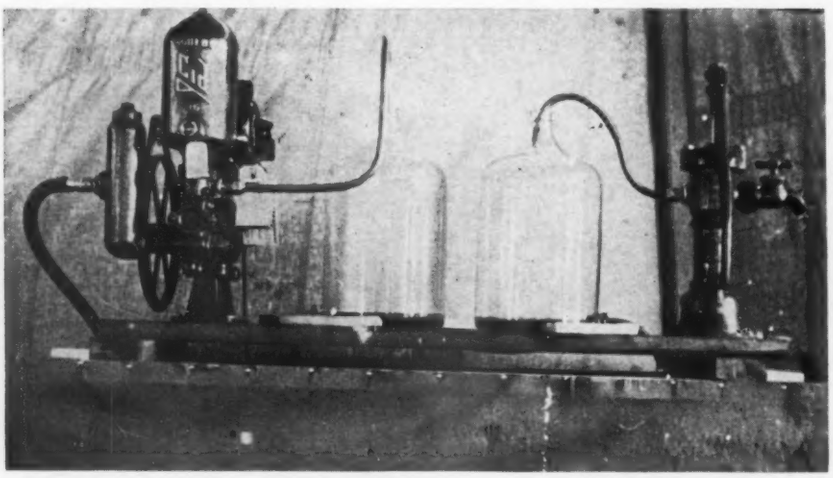
The rural service department of Rochester Gas & Electric Corp. staged a rather unusual and novel demonstration at the recent Ontario Firemen's Field Day, Ontario, N. Y., which drew considerable attention and acted as a stimulus to rural electrification.

The demonstration was to convince visitors of economy of electric pumping on the farm and in rural areas. Two 5-gal. glass carboys were mounted on a platform with a Goulds hand-force pump fastened on one end and a Goulds CID 350-gal.-per-hour electric pump on the other end. Each pump was piped into the carboy nearest it by a piece of $\frac{5}{8}$-in. copper tubing. In the bottom of each carboy a 1-in. hole was drilled. In these holes rubber stoppers were placed having $\frac{5}{8}$-in. copper tubing passing through their centers. These drains discharged into washtubs underneath the platform.

Carl E. Jeerings, supervisor of rural electrification, states that the demonstration was such that the amount of water remaining in the carboy in each case was the difference between the water pumped and the water running out of the carboy through the pipe leading to the washtubs. Suction hoses were connected to the pumps and also placed in the tubs, allowing the water to be used over again. Mr. Jeerings said that by simply restricting one of the suction lines to the pumps an adjustment could be made so that it was not impossible to beat the electric pump.

The procedure was to offer any one a prize of a 100-watt lamp if the carboy could be filled with the hand pump before the electric pump. Handicaps were given in some instances, Mr. Jeerings said. As soon as the person started pumping the electric pump was turned on and the fun began.

All contestants agreed that the electric pump was more than worth its hire, for it was demonstrated that the pump could be operated at 2 cents per hour and no one wanted to work for that wage. Dealers in the territory reported a renewed interest in electric pumps as a result of the demonstration.



PUMP DEMONSTRATION—New interest in electric pumps resulted from the demonstration recently made by Rochester Gas & Electric Corp. Contestants agreed that the electric pump had it "all over" hand pumping. New sales resulted

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Nashville to Start Improvement Plan

A five-year $3,095,000 improvement program has been outlined by the Nashville Electric Service on properties recently acquired by the city from the Tennessee Electric Power Co. Expenditure of $595,000 is contemplated the first year for repairs, rehabilitation and expansion of the system, according to J. P. W. Brown, general manager.

Mr. Brown listed five major items of expenditure for the first year: (1) Construction of several high-tension lines connecting some of the residential substations; (2) replacement of several hundred poles; (3) increasing the size of distribution transformers and secondary service lines fed by these transformers; (4) increasing capacity of distribution lines throughout the residential section, and (5) continuing construction of the underground transmission system serving the uptown business area.

Formerly a vice-president of TEPCO, Mr. Brown said the program was necessitated by the heavy power load carried by the system when taken over, and by the still heavier power load expected to develop beginning with the reduced rates put into effect under the Tennessee Valley Authority.

Expenditures during the remaining years of the program follow: Second year, $700,000; third year, $731,000; fourth year, $575,000, and fifth year, $520,000. After the first five years, Mr. Brown said, normal construction requirements will approximate $500,000 annually. However, such estimates may be upset easily, he added.

SEC Effects Changes to Speed Utility Plans

Divides division into nine units, each charged with enforcing holding company act as it applies to one system or group of systems — Plans to clear preferred dividend arrears

The Securities and Exchange Commission early in the fall will turn its attention to simplification and consolidation of utility holding companies under the terms of section 11 of the holding company act. While in the past the SEC has taken action only in the case of companies which have voluntarily submitted reorganization plans, new activity will now be undertaken, as SEC officials declare, "to place the industry in a position to clear up arrears on preferred dividends and to raise new capital."

While voluntary plans of American Gas & Electric and Columbia Gas & Electric are before the commission and some consideration has been accorded them, there is likelihood that these companies may not be singled out as the first to obtain approval. It is anticipated that in all probability a group of systems will come out of the mill at the same time.

Shift in Division

An administrative shift within the utilities division of SEC has been put into effect to improve the methods of enforcing the holding company act. Joseph L. Weiner, director of the utilities division, states that the division has been divided into nine units and each unit is charged with enforcing the act as it applies to one system or a group of systems. Assignment of the 43 holding companies among the various units has not yet been completed, Mr. Weiner said, but this will be done within the near future.

Each unit will be headed by a senior attorney, an accountant and an analyst, Mr. Weiner explained. These will remain permanent, but other personnel can be shifted from unit to unit as the work demands. Another change is that specialists in each phase of utility operations will review particular operations of each system so as to be in a position to answer questions as they arise.

Heretofore, attorneys and accountants have been organized into a patchwork of groups specializing on enforcement of the various sections of the act. Analysts, however, have been assigned to systems or groups of systems all along. Under the old administrative set-up, a great deal of overlapping resulted, Mr. Weiner said.

"With the new grouping the top men in each unit will be familiar with the peculiar problems of the system or systems to which they are assigned and the work will be expedited," he added.

The reorganization was decided upon shortly after Mr. Weiner, together with Robert O'Brien, assistant director, was elevated to direct the utilities division in June.

Reorganization Desirable

Mr. Weiner stated that the reorganization was desirable, not only from the points of increased efficiency, but also because of the change in the nature of the work under the holding company act. The division has now disposed of practically all of the 400 applications for exemption and the "registration period" has come to a close, he said.

Of major importance to the SEC is the arrearages on preferred stocks. Commissioner Robert E. Healy pointed out last June that 48 utility holding companies with outstanding preferred stocks of $1,330,616,000 had accumulated preferred dividend arrearages of $336,657,000 as of January 1, 1938. Seventy subsidiary operating companies had accumulated arrearages of $95,745,000 on their $442,976,000 outstanding preferred stocks. It is Mr. Healy's contention that as long as such accumulations of arrearages remain uncorrected it is idle to talk about an equity capital market in the public utility industry. It is this problem which the SEC will tackle before proceeding far on integration.

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Steam Turbine Expert Job Passes from Father to Son

A special ceremony was held recently in the office of Max W. Babb, president of Allis-Chalmers Manufacturing Co., which was in the historic guild pattern. Putnam L. Pitcher, retiring from his position as special steam turbine inspector, after 51 years of service with the company, turned his instruments and shop badge over to his son, Harry G. Pitcher, who has served almost 25 years with the company and was appointed to the position made vacant by his father's retirement.

The job remaining in the Pitcher family was created in 1904 when the Allis-Chalmers Co. started to manufacture steam turbines. Until this week nobody had held the position but Putnam Pitcher. No steam turbine has ever been shipped from the Allis-Chalmers works that did not have the Pitcher stamp of approval, and this tradition will continue in the person of his son, who has worked in the steam turbine department beside his father for almost 25 years.

FROM FATHER TO SON—The tools and shop badge of special steam turbine inspector at Allis-Chalmers passed from father to son as Putnam L. Pitcher retired after 51 years and his son, Harry G. Pitcher, was appointed in his place. Max W. Babb, president (center), watches the ceremony in his office

Cooking Council Reports Activity An Aid to Sales

Profit possibilities from this type of load-building equipment shown in report of utilities — Council feels assured that its efforts are well directed — Will continue program

The Commercial Electric Cooking Council, sponsored by the Edison Electric Institute and the National Electrical Manufacturers Association, reporting on its activities for 1938, states that more than 86 per cent of the reporting utilities indicate they intend to avail themselves of the material and help that the council offers for the promotion of this type of business. It was felt that this response reassures the council that its efforts are well directed.

The information from 128 electric service companies shows that the sales and promotion efforts of these companies is convincing proof of the profit possibilities from this type of load-building equipment. The council was formed in 1937 and since that time has been actively engaged in promoting the sale and use of commercial electric cooking equipment.

Interesting Facts

Analysis of the report reveals many interesting facts which should act as a guide in this promotional work. The report showed that 112 companies had a net increase in revenue over the previous year of $156,245, and 123 companies reported estimated annual revenue from cooking equipment of $1,579,401. It was reported that 125 companies sold 65,101 kw. of commercial electric cooking equipment.

In Group B, with 98 companies reporting 50,774 kw. of commercial electric cooking equipment was sold, with estimated annual kilowatt-hour use per kw. connected of 1,151 and estimated annual revenue of $1,308,929. It was estimated that the net increase in revenue over the previous year was $160,659.

Seven companies reported the use of full-time commercial cooking salesmen only, 21 companies reported the use of full-time and part-time salesmen, 98 companies reported the use of only part-time salesmen and eight companies reported that they have no salesmen contacting the commercial cooking field. In the companies that use full-time salesmen for the promotion of this type of business, these specialists averaged $8,660 in E.A.R. per man per year. This was equivalent to an average of $11,135 per company.

Fifty-one companies report they do nothing to offset the cost of wiring, 52 allow from $3.50 to $6 per kilowatt connected up to certain limits, and one company has an allowance based on the E.A.R. of the equipment. Twelve companies furnish wiring plans, four report that the cost of wiring is included in the selling price and three sometimes finance the wiring and one company supplies the switch on electric range sales only.

The report stated that it is interesting to note that last year 52 per cent of the reporting companies did nothing to offset wiring cost of electrical operation, while only 42.5 per cent of the reporting companies this year report they do nothing.

It was reported that more extensive promotion of commercial electric cooking sales during 1939 was planned by 85 companies, while eighteen expected to carry on the same as last year.

The report, signed by P. M. Alden, Philadelphia Electric Co., chairman, contains tables of the results achieved in electric cooking activities by the reporting utility companies.

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Power Exports Need Presidential Permit

Exporters of electric power must henceforth file with the Federal Power Commission an application for a Presidential permit for the construction, operation, maintenance or connection of power lines across the border, under terms of a recently promulgated executive order issued by President Roosevelt and announced by the commission.

Although under the Federal Power Act utilities are required to obtain authority of the commission to transmit power to foreign countries, no mention is made of the fact that the issuance of Presidential permits for the physical connection and maintenance of facilities is also mandatory before such transactions can be carried out. According to commission officials, certain utilities have failed to apply for Presidential permits.

Up until the date of the executive order, the commission had no part in the issuance of such permits. This was done by the State Department with approval of the War Department.

The executive order calls upon the commission "to receive all applications for permits for the construction, operation, maintenance or connection at the borders of the United States, of facilities for the transmission of electric energy between the United States and foreign countries . . . and after obtaining the recommendations of the Secretary of State and the Secretary of War thereon, to submit each such application to the President with a recommendation as to whether the permit applied for should be granted, and if so, upon what terms and conditions."

According to the commission reports, 1,885,316,000 kw.-hr. of electricity was imported from Canada during 1938 and 3,656,000 kw.-hr. exported. Exports to Mexico were 15,021,000 kw.-hr. There were no Mexican imports during that year.

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New Bonneville Rate Schedules Approved

The Federal Power Commission has approved the new rate schedules submitted on August 3 by officials of the Bonneville project which became effective as of September 18.

The two old schedules were retained, two old ones eliminated and two new schedules approved by the commission. Principal change in the tariffs are the adding of the demand and energy rate and the "dump rate," which will be supplemental to the kilowatt-year rate now in effect.

The "at site" prime rate of $14.50 per kilowatt-year was retained, as was the prime transmission line rate of $17.50 per kilowatt-year. A temporary experimental rate, which expires by its own terms on December 31, 1939, was retained.

Secondary power rates of $9.50 per kilowatt-year "at site" and $11.50 per kilowatt-year transmission line were eliminated, since it is expected there will be no secondary power at present available, nor will there be any until additional generators are added.

The new supplemental demand and energy rate provides for ¼ cent per kilowatt-hour plus 75 cents per kilowatt of demand. There is a minimum billing under which customer is never billed for less than 75 per cent of the highest demand charge created in any of the preceding twelve months.

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Rate Probe Scheduled

Arkansas Utilities Commission has scheduled conferences with the Arkansas-Missouri Power Co., Blytheville; the Arkansas Utilities Co., Helena, and other power companies with a view to obtaining lower electric rates.

REA Announces Shifts in Engineering Group

J. K. O'Schaughnessy, regional engineer for the Rural Electrification Administration in Illinois, Indiana and Missouri, has been promoted to a newly created position as assistant chief engineer, the REA has announced. Wade M. Edmunds, consulting engineer on the REA's operations staff, succeeds Mr. O'Schaughnessy in the regional job.

At the same time REA announced a number of other personnel shifts in its engineering division, occasioned by the creation of Mr. O'Schaughnessy's new position and also by the departure of Ben W. Creim for the Bonneville project.

Mr. Creim's regional position has been filled by E. A. Wright, field engineer for the Iowa region. Taking over Mr. Wright's duties in this region and a part of Mr. O'Schaughnessy's duties in the Illinois-Indiana-Missouri region is James C. Ashby, who was connected with REA until 1936, when he became chief engineer for the Indiana state-wide Rural Electric Membership Corp. L. A. Sears, regional engineer for the Wisconsin-Minnesota-Dakotas area, has been transferred to the engineering research section. Mr. Sears has been succeeded by W. L. Woehler, an REA staff engineer.

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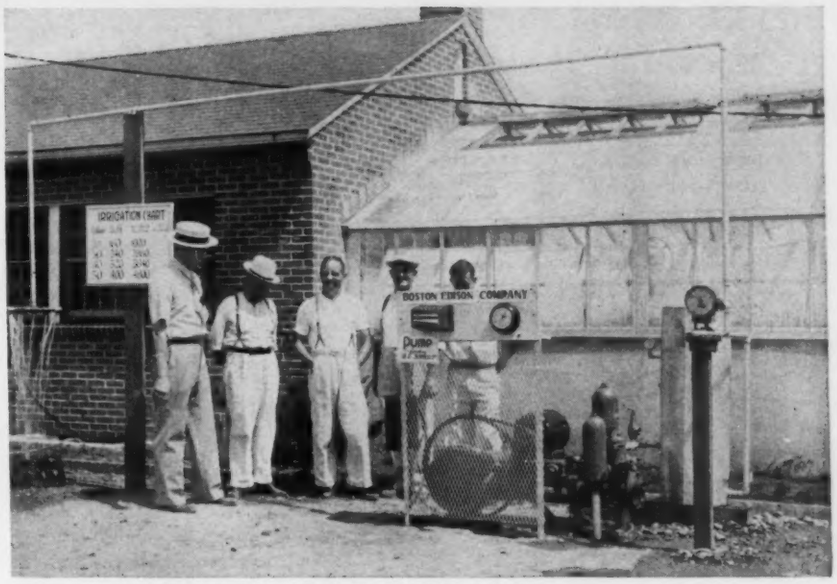
Power Brief Filed by Arizona Board

The Colorado River Commission of Arizona has filed a brief urging the Federal Power Commission to grant the state of Arizona a preliminary permit for a large power project at Bridge Canyon. Appreciating the fact that all the Colorado River Basin states are willing to confer with the Arizona commission before making any official objection to the filing for a preliminary permit on the Bridge Canyon site, the brief states that "Arizona, by being asked to submit a brief, is placed in a peculiar position owing to the fact that the FPC grants to Arizona the right to apply for a permit and license and delegates to the FPC the power and authority to issue permits and licenses for construction and gives to Arizona, as a state, a preferred right to this permit."

The brief states that "it seems mandatory that this permit be granted, enabling Arizona to take such steps as she may hereafter see fit to take, to develop the power possibilities of a resource that is peculiarly her own without coming in conflict with federal laws and regulations. . . ."



ELECTRIC PUMPING—Boston Edison's rural electrification specialist, N. D. Herrick (left), demonstrates low-cost electric pumping for irrigation. Using small Myers piston pump, 30 g.p.m. capacity, 1,200 Massachusetts farmers saw the 30 g.p.m. pumped at a cost of 4.5 cents per hour, based on a 3-cent kilowatt-hour rate

New Rectifier Bought by Wisconsin Utility

Wisconsin Electric Power Co. has purchased a 300-kw., 600-volt ignitron rectifier from Westinghouse Electric & Manufacturing Co. This unit is to be installed at the Commerce Street power plant in Milwaukee and will feed into the 600-volt station direct-current bus and deliver power for street railway service.

The ignitron rectifier consists of two assemblies of six ignitron tubes, each assembly being complete with equipment for maintaining and indicating vacuum. The ignitron rectifier will receive power from a three-phase, 60-cycle, 13,800-volt system through an oil-insulated, water-cooled transformer. The unit will be rated 3,000 kw. at 600 volts direct current continuously, with overload capacity of 150 per cent for two hours and 300 per cent for one minute. The control for the unit is semi-automatic.

It is expected that the unit will be installed by the end of the year.

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Municipal Utility Service Subject to 3% Sales Tax

An Ingram County Circuit Court has ruled that residents of Lansing and seventeen other Michigan cities must pay the 3 per cent state sales tax on electric, steam and gas services furnished them by municipally-owned and operated utilities.

The opinion, handed down by Judge Leland W. Carr, blocked monmentarily, at least, the efforts of the cities to escape the provisions of an act of the 1939 Legislature. Private utilities are subject to the tax.

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Pacific Gas & Electric Franchise Payment Set

Pacific Gas & Electric Co. seems assured of a new perpetual franchise for distribution of gas and electricity in San Francisco as the result of first passage by the board of supervisors of an ordinance calling for franchise rights upon the immediate payment of $475,000 by the company with annual payments thereafter of $160,000.

The new franchise agreement was demanded by the city on the grounds that the company's original state-granted franchise was for the distribution of gas and electricity for lighting only and that the bulk of the company's business is today in the power and heating fields.

The $475,000 payment was taken into account in establishing the city's 1939-40 tax rate, about 8 cents of a 10-cent reduction being attributable to receipt of the company's contribution.

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C. W. Davis Dies

Charles W. Davis, president of the Dallas Power & Light Co., Dallas, Tex., died in that city September 16, following a heart attack. He was 64 years of age. Mr. Davis had been president of Dallas Power & Light since 1930.

Prof. Scott Honored on 75th Birthday

Congratulations and encomiums were showered on Prof. Charles F. Scott (emeritus Yale) at a dinner this week arranged by the Connecticut Section, A.I.E.E., on the occasion of his 75th birthday. Many from New York, Pittsburgh and Ohio points journeyed to New Haven to participate.

Frank B. Jewett, president of Bell Laboratories, and F. M. Farmer, president of A.I.E.E., recounted Professor Scott's achievements in the field of technology and education and his most recent energetic activity on the professional side as president of the association of state examining boards.

C. E. Stephens, vice-president of the Westinghouse company, recalled Professor Scott's early achievements with that company in promoting the cause of alternating current by perfection of transformers and transmission equipment.

Former President Angell of Yale and former Governor of Connecticut Wilbur L. Cross recorded appreciation of the guest's accomplishments in the teaching field and on behalf of the advancement of the engineering profession, Mr. Cross as Governor having appointed Professor Scott as chairman of the first Connecticut board of licensing and registration.

Professor Scott in response made a plea for greater recognition of the needs of young men in the profession and within the professional societies.

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AMA to Discuss Nation's Production Problems

How American industry can meet its problem of controlling unit costs through more efficient plant facilities as it becomes the world's remaining big-scale producer of goods will be the theme of a conference of hundreds of production executives, to be held by the American Management Association in Chicago, November 15-16.

The sessions, which will be held at the Palmer House, will bring together representatives of virtually every industry in the United States for a discussion of modern production equipment and systems. Some of the subjects include lighting for production and heating, ventilating and air conditioning as a factor in production efficiency.

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Give Industrial Courses for Selected Engineers

Three New York technical institutions, in co-operation with the Westinghouse Electric & Manufacturing Co., have announced a series of post-graduate courses in industry which will enable selected graduate engineers to study modern research and manufacturing methods and earn credit for masters' and doctors' degrees. The co-operating schools are New York University, Polytechnic Institute of Brooklyn and Stevens Institute of Technology. J. H. Belknap represented Westinghouse in the negotiations.

Among the first courses authorized will be classes in advanced illumination and in symmetrical components. D. W. Atwater, manager of the commercial engineering department of the Westinghouse lamp division and former president of I.E.S., will give the course in illumination and B. V. Hoard, meter engineer Westinghouse Meter Works, Newark, N. J., and S. H. Wright, industry engineering department of Westinghouse, will give the course on symmetrical components.

MEETINGS

Association of Iron and Steel Engineers—Annual convention and exposition, William Penn Hotel, Pittsburgh, Pa., September 26-29. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

American Institute of Electrical Engineers—Great Lakes district, Minneapolis, Minn., September 27-29; Middle Eastern district, Scranton, Pa., October 11-13. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Southeastern Electric Exchange—Engineering and operation section, Piedmont Hotel, Atlanta, Ga., September 28-29; sales section, fall conference, Henry Grady Hotel, Atlanta, November 2-4. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta.

Indiana Electric Association—Annual convention, French Lick, Ind., September 28-30. Tom C. Polk, secretary, 607 Traction Terminal Bldg., Indianapolis, Ind.

Edison Electric Institute—Prime movers committee, Institute headquarters, 420 Lexington Av., New York, October 2-3; electrical equipment committee, New Ocean House, Swampscott, Mass., October 9-10; transmission and distribution committee, New Ocean House, Swampscott, October 10-11.

International Association of Electrical Inspectors—Eastern section, Providence-Biltmore Hotel, Providence, R. I., October 2-4.. F. N. M. Squires, secretary, 85 John St., New York, N. Y.

International Association of Electrical Leagues—Annual conference, Auditorium, Electrical and Gas Association of New York, Inc., New York, N. Y., October 4-6.

Public Utilities Association of West Virginia—Annual meeting Greenbrier Hotel, White Sulphur Springs, W. Va., October 6-7. A. Bliss McCrum, secretary, 612 Charleston National Bank Bldg., Charleston, W. Va.

International Municipal Signal Association—Annual meeting, Providence-Biltmore Hotel- Providence, R. I., October 9-12. Irvin Schulsinger, secretary, 7 East 42 St., New York, N. Y.

National Electrical Contractors Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., October 9-12. L. W. Davis, general manager, 420 Lexington Av., New York N. Y.

National Electrical Wholesalers Association—Semi-annual convention, Hotel Gibson, Cincinnati, Ohio, October 16-20. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Safety Congress and Exposition—Atlantic City, N. J., October 16-20.

Empire State Gas & Electric Association—Annual convention, Westchester Country Club, Westchester, N. Y., October 19-20. George H. Smith, secretary Grand Central Terminal, New York, N. Y.

National Electrical Manufacturers Association—Annual meeting, Palmer House, Chicago, Ill., October 23-27. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Wisconsin Utilities Association—Electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., November 6-7. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee.

Washer Group Plans National Campaign

Final plans for the second annual washer and ironer week were drawn up at a special meeting held recently by the American Washer and Ironer Manufacturers Association in Chicago. At the same time the association made plans for setting up a board within the industry that would arrange minimum standards of quality and performance for washing machines.

National Washer and Ironer Week will be held throughout the nation October 14–21, and the goal of the sales campaign has been set at 100,000 machines. Total washer sales for the first seven months of 1939 were 838,877 units, compared with 615,917 in the similar period of 1938.

John M. Wight of General Electric Co., Bridgeport, Conn., was appointed chairman of the committee which will explore the feasibility of fixing standards for equipment and do other preliminary work in this direction.

According to John R. Bohnen, executive secretary-treasurer of the association, it is intended that performance standards for home laundry equipment will be modeled along lines of those fixed by the Illuminating Engineering Society and followed by the electric lamp industry.

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Plan Electrical Exhibits at Iron and Steel Meet

An amplidyne motor-generator set, photoelectric pyrometer equipment and several electronic devices—all in operation—will feature the General Electric exhibit at the meeting of the Association of Iron and Steel Engineers, to be held in Pittsburgh September 26-29.

Westinghouse Electric & Manufacturing Co. will have in actual operation a 1,200-amp., 5,000-volt metal-clad De-ion circuit breaker and a 1,600-amp., 600-volt circuit breaker with high interrupting capacity. There will also be an industrial lighting and lamp display.

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Temperature Symposium

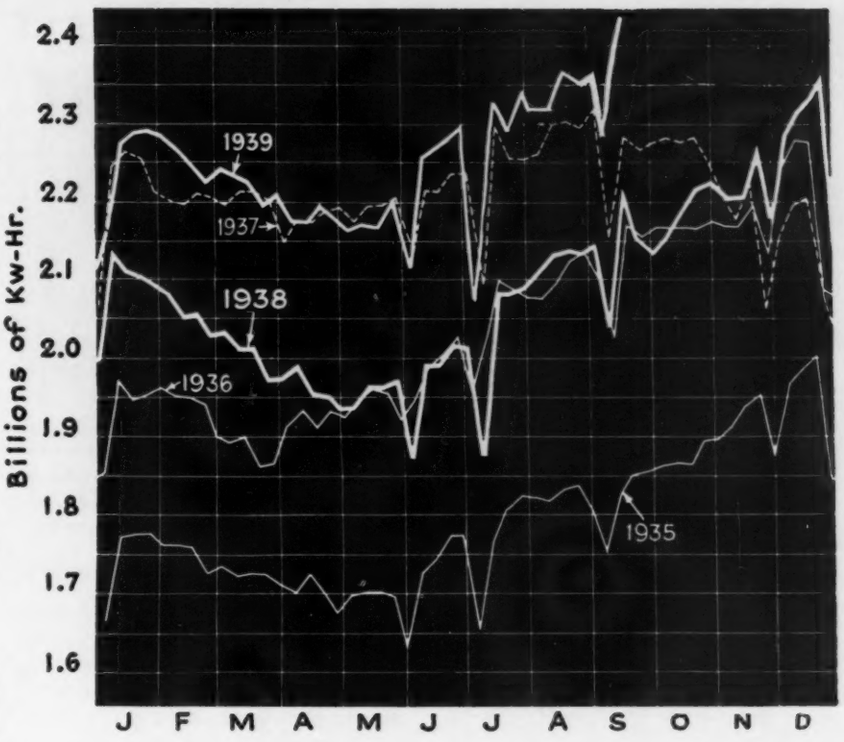
A symposium on temperature, its measurements and control in science and industry, is to be held November 2-4 at the Hotel Pennsylvania, New York City, under the auspices of the American Institute of Physics with the cooperation of the National Bureau of Standards, the National Research Council, and officers and committees of many technical societies.

Output Surges to New All-time High

Setting a new record of 2,444,371,000 kw.-hr., according to the Edison Electric Institute, the output of energy by the electric light and power industry during the week ended September 16 exceeded that of the like period a year ago by 10.4 per cent. It surpassed the 1937 figure by 7.2 per cent.

The excess over the preceding maximum, in the week of August 19, was nearly 77,000,000, or 3.3 per cent and over the peak of last December it was more than 81,000,000 kw.-hr., or 3.4 per cent. The continued large gain over 1938 is especially noteworthy in view of the upswing at this time last year.

The strong recovery from the dip due to Labor Day appears to reflect increased industrial activity stimulated by the foreign situation, supplemented by the effect of abnormally hot weather over large sections of the country on the refrigeration load. Regional percentages over 1938 must be viewed in the light of last year's pronounced rise. In the Central Industrial area increasing activity in the automotive and other heavy industries is reported. In the South textile operations greatly increased: mills are stated to have been reopened. Rising production of copper and zinc should have raised the percentage in the Mountain states, which, however, remains around 15 per cent. Despite the heat in California the Pacific Coast ratio dropped to 5.6 per cent.



Weekly Output, Millions Kw.-Hr.

1939	1938	1937
Sept. 16...2,444	Sept. 17...2,215	Sept. 18...2,281
Sept. 9...2,290	Sept. 10...2,048	Sept. 4...2,321
Sept. 2...2,357	Sept. 3...2,149	Aug. 28...2,295
Aug. 26...2,355	Aug. 27...2,134	Aug. 21...2,304
Aug. 19...2,368	Aug. 20...2,139	Aug. 14...2,301
Aug. 12...2,333	Aug. 13...2,134	Aug. 7...2,262

Per Cent Change from Previous Year

	Week Ending		
	Sept. 16	Sept. 9	Sept. 2
New England	+11.3	+11.3	+11.6
Middle Atlantic	+ 8.3	+13.7	+11.6
Central Industrial	+13.6	+14.4	+12.8
West Central	+ 9.4	+ 9.8	+ 5.1
Southern States	+11.1	+ 7.7	+ 1.2
Rocky Mountain	+14.6	+14.8	+19.6
Pacific	+ 5.6	+ 8.4	+ 8.8
United States	+10.4	+11.8	+ 9.7

Standard Gas Denied Injunction on Taxes

In refusing to grant the Standard Gas & Electric Co. an injunction restraining collection of personal property taxes which the company claimed were "an inequitable burden, confiscatory and invalid," Judge John Lupe ruled in Chicago recently that the holding company must pay $1,493,000 in taxes to the Cook County treasurer for 1937 and 1938. The Illinois personal property tax levy was blamed by the company for the removal of its headquarters to New York last April.

The company's plans to return its headquarters to Chicago will be determined by the outcome of an appeal to the Illinois Supreme Court, Michael Ahearn, attorney for the company, indicated.

Judge Lupe's decision also bears on the Middle West Corp., which moved its headquarters from Chicago to Wilmington, Del., because of the Illinois tax on personal property and intangibles.

Both companies moved to escape taxes levied on stocks of operating companies held by the parent companies. They contend that they should be exempt from taxes on stocks of out-of-state operating companies which were held in Illinois, and that tax levies should be confined to property actually used in Illinois and to stocks of Illinois companies.

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Decatur Plans $500,000 Modernization Program

Decatur, Ind., City Council is planning to begin a $500,000 modernization program of its municipal light and power plant to handle the increased power consumption of local industries, following a recommendation by F. H. Froehlich, consulting engineer of Toledo, who stated that the municipal plant faces danger due to the fact that at peak production all facilities are used, leaving no reserve in the advent of breakdown of any of the equipment.

City Council proposes to take $100,000 from the cash balance left from last year, $100,000 from the new balance expected at the end of this year, and issue bonds for the remaining $300,000, payable over a ten-year period, to finance the improvements. The new plant is proposed to include a 5,000-kw. turbo-generator, a 400-lb. pressure, 700 deg. F. boiler, condensers, switchboard and other equipment.

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City Plant Buys New Unit

Bryan, Ohio, Board of Public Affairs has approved the bid of the Nordberg Manufacturing Co., Milwaukee, for a new 2,250-kw. capacity Diesel engine to be placed in the municipal power plant at a cost of $176,000. It will be nearly a year before the new unit will be in operation. Installation will begin next May. The new unit is bought in anticipation of continued growth of the demand for electricity in Bryan.

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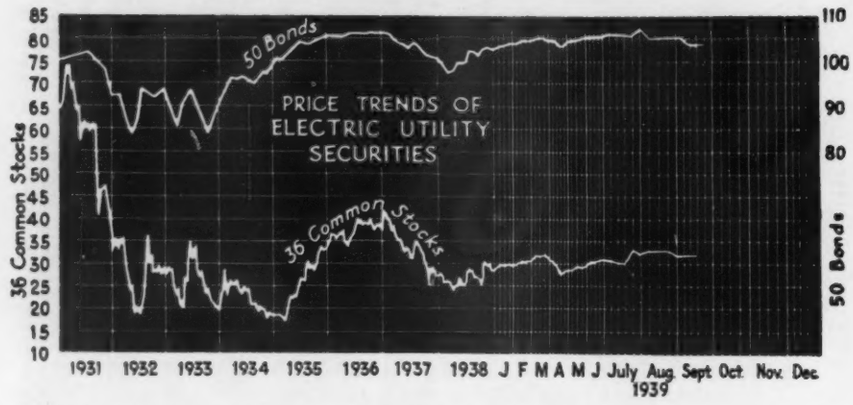
Sabotage Precaution

As a "precaution against possible sabotage," the Susquehanna Electric Co. has notified the Conservation Department that it was forbidding fishing from the Conowingo Dam, above Havre de Grace. Since the spot is a favorite for fishermen, the company stated it "regretted" the restriction, but took the action "in view of present conditions abroad."

Light and Power Stocks Rise


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec. 1939

Utility stocks turned upward during the past week, the "Electrical World" index advancing from 30.1 last week to 30.5; last year, 25.8. No substantial changes occurred in the bond list. Index, 103.6; last week, 103.7

Maryland Approves $5,517,500 Issue

Maryland Public Service Commission has approved a $5,517,500 issue of bonds by four Eastern Shore electric power companies with the provision in each case that the issues should not be considered in any future valuation case.

Of the new money, $3,981,500 will be used to refund at 4 per cent bond issues now paying 5½ and 6 per cent. Of the $1,536,000 of new money, $600,000 will be used for an addition to Delmarva Power Co.'s generating plant at Vienna, Md.

The commission specifically gave three Maryland companies, Delmarva, Maryland Light & Power and Eastern Shore Public Service Co. of Maryland, power to issue bonds and extra stock to secure them.

The bonds and stock will be turned over to the Eastern Shore Public Service Co. of Delaware, the parent company, which in turn will pledge the securities with the Pennsylvania Co. for Insurances on Lives and Granting Annuities as security for an issue of bonds of Eastern Shore of Delaware Co.

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File Plea for Rehearing on Utility Valuation

Motions for a rehearing in the valuation proceedings for the Kansas City Power & Light Co. have been filed with the Missouri Public Service Commission by the company and by electric consumers of Kansas City who had intervened in the original action.

Last month the commission issued its report on the valuation, fixing the fair value of the company at $71,000,000 and ordered a rate reduction of approximately $160,000. In its motion for rehearing the company alleged the commission erred in fixing the $71,000,000 fair value, in determining the cost of reproduction, in the allocation of property not used in public service and in refusing to reinstate a claim for $560,000 reorganization expense in the rate base.

•

FPC Consolidates Action on Utility Merger Pleas

Consolidation of proceedings on applications whereby two subsidiaries of American Utilities Service Corp. seek authorization to sell all of their electric facilities in West Virginia and Kentucky, respectively, and two subsidiaries of American Gas & Electric Co. seek authorization to acquire such properties has been ordered by the Federal Power Commission. Hearing has been set for September 29.

In June Southern Utilities Co. filed an application requesting authority to sell its electric facilities in West Virginia to Appalachian Electric Power Co. for $80,000 in cash, and Southern Public Service Co. concurrently filed an application seeking similar authority to sell its Kentucky facilities to Kentucky and West Virginia Power Co., Inc., for $70,000 in cash. Southern Utilities and Southern Public Service are subsidiaries of American Utilities Service Corp., while Appalachian Electric Power Co. and Kentucky and West Virginia Power Co. are subsidiaries of American Gas & Electric.

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Extends Merger Deadline

Finding that circumstances over which the applicants have no control have arisen which may prevent the disposition and sale of the facilities of the Northern Pennsylvania Power Co. to the Metropolitan Edison Co. within the 60-day time limit specified in the commission's order of July 6, the Federal Power Commission has extended to January 6, 1940, the time within which such disposition and sale shall be effected.

•

Simplification Plan Filed with Board

SEC has announced a public hearing on September 25 in Washington, D. C., on the application and declaration, under the Holding Company Act, of the Minneapolis General Electric Co. and its subsidiaries, in connection with the proposed partial simplification of the holding company system. The simplification would be accomplished by the transfer of properties, assets and securities among the parent company and its subsidiaries, and as a result of this transaction three of the subsidiaries, Western Wisconsin Power Co., St. Croix River Navigation & Improvement Co. and St. Croix Lumbermen's Dam & Boom Co., would be eliminated.

The remaining subsidiaries would be the St. Croix Falls Wisconsin Improvement Co. and the St. Croix Falls Minnesota Improvement Co., and the former company would, as a result of these transactions, own the entire St. Croix Falls hydro project and the Nevers Dam development on the St. Croix River.

Other statements registered follow:

Illinois Iowa Power Co. has filed on Form U-5-B the complete form for registration under the Holding Company Act.

Middle West Utilities Co. of Canada, Ltd., has filed an application for an order approving the acquisition for retirement of 7,400 shares of its outstanding $100 par value $7 cumulative preference stock.

The commission has authorized the New York Power & Light Corp. to issue $66,582,000 of 3⅜ and 3½ per cent bonds to refund its present debt, which bears 4½ to 5 per cent interest.

Western States Utilities Co. has been authorized to issue $350,000 of first mortgage 4½ per cent bonds due September 1, 1959.

Utility Reports

	Net Income 1939	1938
*Amer. Gas & Elec and subs.	$13,313,009	$11,858,084
*Calif. Oregon Pwr.	948,461	883,595
*Kansas City Pwr. & Lt.	3,701,040	4,153,110
*Louisville Gas & Elec.	2,749,185	2,751,407
†Narragansett Electric	2,134,299	2,376,595
*Nevada-California Elec.	374,181	547,893
*Northwestern Electric	510,536	491,122
*Oklahoma Gas & Electric	2,678,015	2,475,467
*Pennsylvania Edison	1,035,359	968,082
†Rhode Island Public Serv.	2,003,650	2,240,494
*San Diego Consol. Gas & Elec.	1,470,527	1,263,821
*Southern Colorado Pwr.	275,606	199,009
*Wisconsin Pub. Serv. and sub. company	1,570,275	1,266,070

*Twelve months ended July 31.
†Twelve months ended June 30.

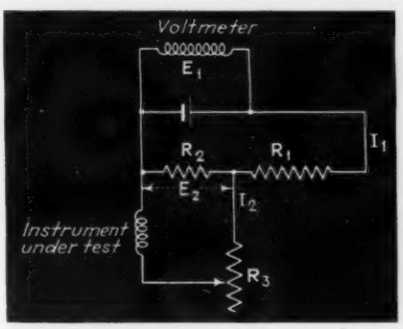
OPERATING PRACTICES

Avoids Low-Reading Standards

By ARTHUR W. WEEKS
Boston Edison Laboratory

Calibration of very sensitive instruments partaking of the nature of galvanometers sometimes presents a problem because of the lack of low-reading reference standards. The simple circuit shown with the aid of a Wheatstone bridge, a voltmeter and a few resistors will solve this difficulty.

The battery voltage is measured by the voltmeter and from this and the known resistance of R_1 and R_2 the current I_1 is calculated. R_2 is used as a shunt and from its resistance and the calculated current through it the voltage E_2 can be known. This voltage (E_2) is impressed on the instrument to be calibrated, in series with a variable resistor R_3, which provides for adjusting to scale points. From E_2 and total resistance on which it is impressed the current I_2 for any setting of the instrument under test is computed.



Connection diagram for galvanometer calibration

Should the calibration be desired in terms of volts this can be determined from the current and the instrument resistance:

Suggested Values of Resistance		Calculations
R_1	10,000 ohms	$I_1 = \frac{E_1}{R_1 + R_2}$
R_2	2 ohms	$E_2 = I_1 R_2$
R_3	3,000 ohms	$I_2 = \frac{E_2}{R_3 + R_G}$
		R_G = Resistance of instrument under test.

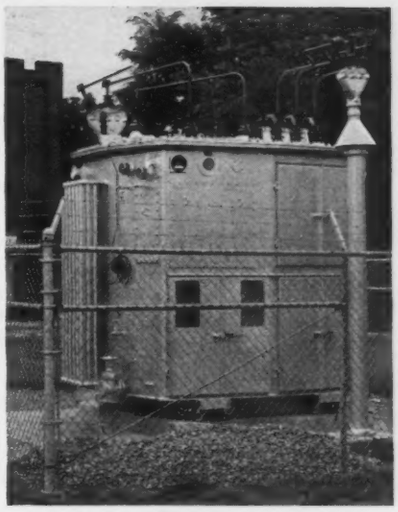
Network Supply Costs $10.87 per Kva.

By S. R. FINLEY
Chief Engineer
Electric Power Board of Chattanooga (Tenn.)

An average of $20,397 per station or $10.87 per kva. of available capacity was the cost for the unit substations plus low-side breakers on the 4.0/2.3-kv. "overhead network" distribution system of the Electric Power Board of Chattanooga. These figures are based on five sectionalizing oil circuit breakers per four substation units installed.

Stations have been located on corners of areas 1½ to 2 miles square and 4.0/2.3-kv. tie lines between stations have automatic-reclosing, platform-mounted oil circuit breakers located equidistant between stations. The Westinghouse CSP-type power transformer units have 12.0-kv. feed-in and 4.0/2.3-kv. feed-out lines cabled into station inclosures to eliminate overhead lines; telephone connection and water supply are provided inside each inclosure.

All units are rated 1,500 kva. with 1,875 kva. capacity available by use of fans. The 12.0-kv. side of the unit is connected without fuses or oil circuit breaker to the overhead lines and the 4.0-kv. side through a built-in automatic-reclosing oil circuit breaker to the overhead lines. Metering is provided for the 4.0-kv. output as well as voltage recording over a seven-day period, the regular inspection period.



Installed at a total involved cost of $20,397, this 1,500-kva., 12.0-kv. to 4.0-kv. distribution substation serves the overhead 4-kv. network in Chattanooga

Average costs per station based on completed units have been:

One 1,500/1,875-kva., 12 5 to 4.0/2.3-kv. automatic tap-changing unit type substation, including built-in oil circuit breaker and accessories	$12,980.00
Cost of station cables, station risers frotheads, installation, fencing, etc.	3,283.00
Land	721.00
Landscaping, sodding	350.00
Cost per station	$17,334.00
Cost per kva. (1,875-kva. basis)	9.25

Average cost of platform-mounted sectionalizing 4.0/2.3-kv. oil circuit breakers has been:

One 400-amp., 7.5-kv., 50,000-kva. oil circuit breaker with relays and controls	$1,800.00
Accessories and installation	650.00
Cost per oil circuit breaker installation	$2,450.00

Under the TVA-Commonwealth & Southern purchase agreement Chattanooga will acquire the electric distribution system serving this district. This system has 12-kv. overhead lines,

similar to those planned and built by the Power Board, and the unit substations will be cut into service from the consolidated system and the 4.0/2.3-kv. overhead network development continued.

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Fireproofing Cables

II—High Voltage

D. C. HAWLEY*
Kansas City Power & Light Company

In the Kansas City system a special type of fireproofing is in use for cables operating over 4,000 volts.

Formerly, concrete applied over cables to a thickness of approximately ½ in. was used, the cable first being wrapped with a No. 6 hemp twine with a spacing of approximately ½ in. This method proved very unsatisfactory, particularly from the standpoint of maintenance. The concrete cracked due to the expansion and contraction of the cable. An attempt was made to remedy this fault by the development of a "flexible cement" now on the market. Although this was found to be slightly better than ordinary cement, methods of installation of this fireproofing resulted in an uneven thickness of the material around the cable.

*Abstract of paper, Missouri Valley Electric Association.

From this type of fireproofing a change was made to the use of an asbestos felt with a burlap backing $\frac{3}{16}$ in. thick (Niagrite B). One layer of this material was wrapped on the cable with no lapping. Over this was applied a covering of a refractory cement (asbestoment) $\frac{3}{8}$ in. thick. This type of fireproofing proved a great deal better than the rope and concrete, and not so much difficulty was experienced with the falling off of the cement covering as with the concrete and rope. If the asbestoment did fall off, there was still a fireproof covering over the cable. However, this asbestoment covering did crack and cause a considerable amount of maintenance. The cost of this type of fireproofing was approximately 170 per cent more than the rope and concrete.

Having experienced a high degree of success with the fireproofing used on the low-voltage cables, it was decided to change the manner of fireproofing of the high-tension cables so as to include the listing covering instead of asbestoment. The felted asbestos was applied the same as before, but instead of using the $\frac{3}{8}$-in. coating of asbestoment, a layer of listing was applied over the asbestos felt and a brushed coat of asbestoment applied over this for waterproofing. This change has cut the maintenance of fireproofing on transmission cables to practically nothing. In addition, the fireproofing itself is more efficient. The cables are flexible and can be bent without destroying the fireproofing. It is very resistant to abrasion and practically impossible to damage.

The cost of this fireproofing is 36 per cent less than the Niagrite and asbestoment type. Saving is all in the labor, as the material cost is increased slightly. The following table gives an idea of the comparative costs of the various kinds of fireproofing mentioned; costs given are for productive labor only.

	Concrete and Rope 3" O.D. Cable	Niagrite and Asbestoment 3" O.D. Cable	Niagrite and Listing 3" O.D. Cable
Man-hours labor per ft.	0.22	0.441	0.141
*Unit cost, labor per ft.	0.21	0.41	0.129
Unit cost, material per ft.	0.05	0.30	0.327
Total labor and material cost per ft.	0.26	0.71	0.456

* Cash based on $0.92 per hour labor.

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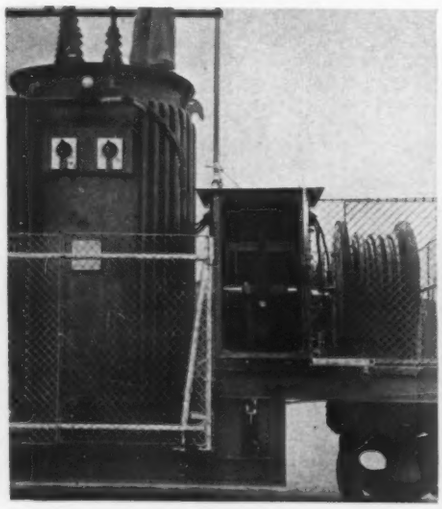
Functional Designs for Service Trucks

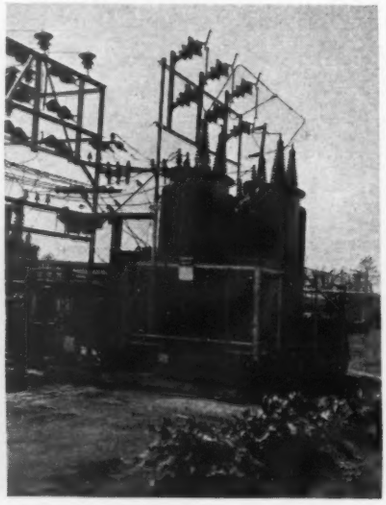
All work incident to connecting or disconnecting the service lines to customers' premises is done from trucks specially equipped for this work by the Indianapolis Power & Light Company. The body of these ½-ton trucks is of all-steel construction approximately 4x2½x5½ ft. long, with a double door in the rear which opens to nine compartments of various convenient sizes. Fitting into these compartments are steel trays, the upper five of which carry tools and materials. The lower four trays are especially designed for holding six meters in each, or a total of 24 meters, with sponge-rubber cushions on all sides for meter protection. Meter trays have a handle at each end for convenient carrying in and out of the meter stockroom.

Mounted on the left of the body is an extension ladder and carried on the top are coils of wire (usually one coil of No. 6 and one of No. 8, of about 125 lb. each), for making connections between house and pole. In the front of the body is a full-width compartment, accessible through a door about 14 in. square on the right side just back of the cab, for rubber coats, boots, hose, gloves and rope.

There are sixteen of these connection trucks in the company's fleet,

Mobile Substation Has Telescoping Structure





The illustrated mobile substations, used during emergency and maintenance operations on the system of the Central Illinois Public Service Company, Springfield, have protective fuses and bus work arranged on telescope pipe mountings so that the entire arrangement can be lowered during transportation to provide overhead clearances. These substations have a total capacity of 1,500 kva. and are suitable for use on the following voltages: 66,000/33,000, 11,940 Y —6,900—4,400 Y and 2,300 volts. The transformers are mounted on a four-wheel heavy-duty trailer. Space is provided on the trailer bed to carry a reel of cable to connect the substation to existing structures.

Sixteen specially built service trucks handle all customers' service construction on Indianapolis System

each operated by two men. They handle all work of installing and removing meters as well as connecting the circuits of customers to the company lines. They start from the operating headquarters each morning with sufficient material for a full day's work and adequate equipment for a wide variety of jobs, including emergency line work.

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Table Setup for P. T. and Ground Test

By C. H. COTTLE
Meter Engineer
Scranton Electric Company
Scranton, Pa.

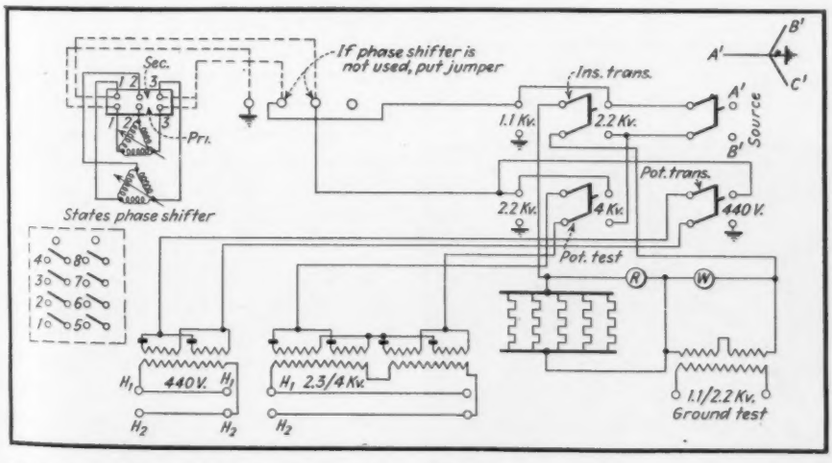
For making tests on potential transformers, insulation tests and ground tests we use in our laboratory a permanent test table which performs all three functions. The source is a three-phase, four-wire circuit rated 120 volts wye, 208 volts delta and protected by one 100-amp., three-pole circuit breaker.

From the load side of the main switch phase A is connected a terminal so arranged that the circuit may be connected straight through for use without regulation or a phase shifter used as a voltage regulator for minimum and maximum voltages. Phase B and neutral are connected through selector switches for variation of the input voltages.

The 2.2/4.4-kv. step-up transformers are standard 3-kva. distribution, rated 2,300 volts primary, 115/230 volts secondary. The low-voltage coils are connected in parallel on each transformer and both transformers are connected in series on the high- and low-voltage windings. Regulation from 500 to 5,000 volts can be obtained. The two 3-kva. transformers could be replaced with one rated 4.4-kv. to 115/230 volts. However, the circuit as indicated has rendered satisfactory service for many years.

The 440-volt bus operates similar to the above except the transformer is 3-kva., 440 to 120/240 volts.

A burden for loading potential transformers equipped with the necessary selector switches for individual or combination of burdens is located on the table. Four units rated 50 va. at 1.0 P.F. and four units rated 50 va. at 0.1 P.F. are in the unit.



Voltage transformer tests, insulation and ground tests made by means of this test circuit

Various standard burdens for potential transformers are obtained by means of a group of impedances employed thus:

Switches 1, 2, 3, 4 in on position connect reactance units into circuit for O.I.P.F.

Switches 5, 6, 7, 8 in on position connect resistance units into circuit for unity P.F.

Each switch controls 50-va. unit.

Other burdens may be obtained by combinations of resistance and reactance up to 300 va. at 0.74 P.F.

The ground test outfit consists of one 3-kva. distribution transformer rated 2,300 to 115/230 volts and arranged with a selector switch for 1,200 or 2,080 volts at the test electrodes. Limiting resistors and indicating lamps are included. This scheme of ground test has been in use approximately twenty years.

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Bushing Reconditioning

By C. B. WISBON
Toledo Edison Company

A general survey of all bushings showed that the dependable life of more than 80 per cent of all bushings in the 37-kv. class had been reached. A reconditioning program was instituted and the construction of a combination of vacuum and blower-type oven was planned.

This oven is 6 ft. long, 5 ft. high and 3 ft. deep, is made of sheet metal which is covered with 1½ in. of asbestos and is heated with ten 1,500-watt space heaters. At the top of the oven is a 4-in. inverted blower and at the bottom of the oven are six intake ports where fresh air is drawn in by the vacuum created by the inverted blower. This allows sufficient fresh air for temperature control and the removal of all fumes. A constant temperature is maintained by thermostatic control and a temperature of 105 deg. C. is used for the greater number of drying jobs.

Spare bushings, oil circuit breaker parts, etc., had values found to be due to the long periods of time during which this equipment was placed in storage rooms and, no doubt, was due to condensation.

In order to overcome this difficulty it was decided to build a storage oven. This oven is 10 ft. long, 6 ft. 6 in. high and 36 in. deep and is capable of storing spare equipment such as bushings, oil circuit breaker parts, wood, etc. This oven is heated with a small 1,000-watt blower type heater commonly used in bathrooms. It is thermostatically controlled and a temperature above 85 deg. F. is always maintained.

In the extreme end of this oven it will be noted that a number of oil circuit breaker parts, such as wood members, etc., may be stored under clean dry conditions.

*Abstract of paper presented at recent Doble Engineering conferences at Medford Hillside, Mass.

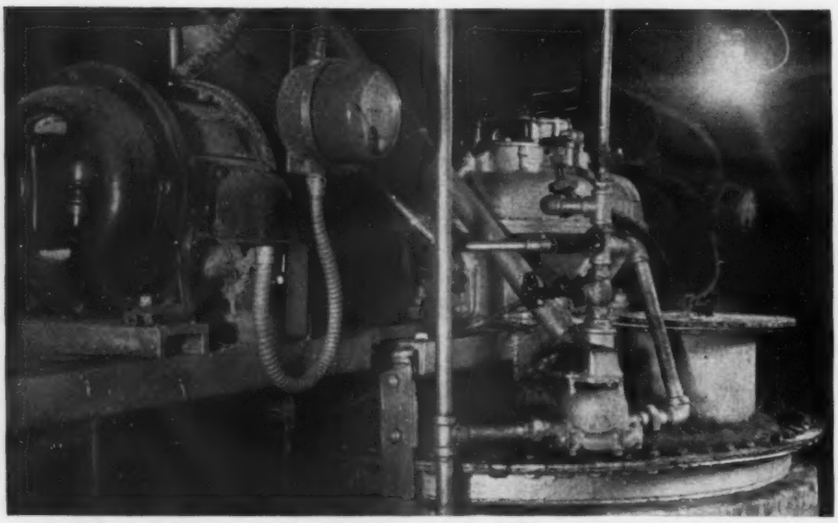
INDUSTRIAL ENGINEERING

Ammeter Checks Paste Kettle Load Changes

In connection with the remodeling of an individual motor drive in an Eastern paste factory a 10-amp. Westinghouse ammeter was arranged for permanent plugging into the leads of a 10-hp., 550-volt, three-phase motor which operates a 750-gal. kettle, in order to provide the production department with a continuous rough check on the consistency of the material being processed. The ammeter indications range from about 4 amp. with the kettle running dead to full-scale or more with maximum viscosity. The readings do not eliminate viscosity tests for a fine check on the weight and consistercy of paste being processed, but have proved so useful a a quick gauge of conditions that a second kettle has been equipped in this way, and ultimately six units will be furnished with ammeters mounted close to the motors as indicated. The ammeters may be plugged into the motor circuits of adjacent pumping equipment when it is desired to check the current consumption and mechanical conditions of these units.

Quiet Operation

The improved drive for paste kettle service utilizes a centrifugal coupling on the motor shaft and the speed is reduced by a Falk gear installation in the ratio of about 20 to 1 between the motor and the main shaft of the kettle. Twelve adjustable motor speeds are provided by using a wound-rotor design with step control. The former drive used silent chain from the motor pinion to a shaft gear and succeeding bevel gear drive at the kettle. With the new layout no trouble has been experienced from breakage and the operation is quiet and extremely compact.



Ammeter mounted at motor indicates drive conditions

Standardized Ratings for Meters at Fair

By KNOX F. BURNETT
Exhibit Engineer
New York World's Fair of 1939

Maximum salvage value and highest possible degree of standardized interchangeability dictated the program of metering the exhibit buildings and concessions at the Fair. Up to 3 kw. connected load the energy is flat rate unmetered service. Between 3 and 5 kw. connected load it is optional with the consumer whether the energy will be metered. Above 5 kw. connected load all services are metered. It was desirable to have a minimum number of ratings of both self-contained secondary and transformer type primary meters.

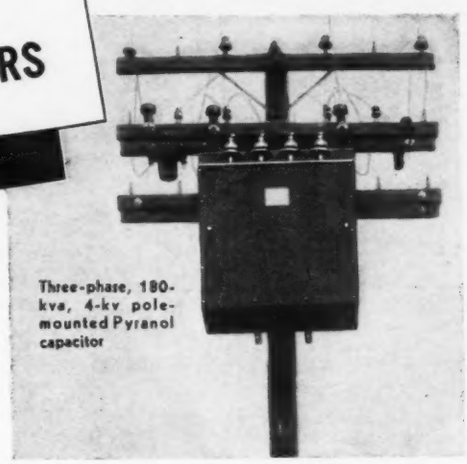
Originally the 50-amp., 120-volt, single-phase meter was selected as appropriate up to 12 kw. From 12 to 18 kw. of estimated connected load, the two-element, 120/208-polyphase meter was to be provided with loading taken from two phases and neutral of the 4-wire network. From 18 kw. to 40 kw. the 2½-element, 50-amp. meter for three-phase loading was to be the standard.

In the effort further to promote flexibility and standardization it was finally decided to serve all consumers with a three-phase, four-wire service and meter with the so-called 2½-element meter having three current and two potential coils. The 15-amp. capacity is applied on loads up to 13.5 kw. and the 50-amp. size on loads not exceeding 40 kw.

Further, all higher ratings requiring transformers are founded on the same basic secondary values. Primary service is at 2,300/4,150 volts, therefore 20/1 potential transform-

They Got Feeder Capacity for $7 per kw Instead of $21.50

HOW A MISSOURI UTILITY PROFITED BY USING DISTRIBUTION CAPACITORS



Three-phase, 180-kva, 4-kv pole-mounted Pyranol capacitor

FOUR years ago the Union Electric Company of St. Louis needed a substantial increase in capacity on one of its feeders to meet the anticipated winter peak loads of 1935-36.

One way to obtain this capacity was to install a new feeder—capacity 1500 kw—costing $21.50 per kw. Instead, the power company engineers worked out a method of increasing the load-handling ability of their overhead distribution circuits by applying shunt capacitors arranged for pole mounting. This method of approach enabled the company to get the capacity it required at much lower cost than that of building a new circuit. They installed two 180-kva pole-type equipments and released 500 kw of capacity at a cost of $7 per kw by improving power-factor on the existing circuits.

Inasmuch as 500 kw of capacity was calculated to be adequate for all requirements during the near future, the larger investment in the new feeder would have been largely for excess capacity—another factor favoring the use of capacitors. This company has found this method of increasing system capacity so satisfactory that today it has installed over 16,000 kva in this type of equipment.

The Service Record of G-E Pyranol Capacitors

Today, after G-E Pyranol capacitors have been in service nearly four years, the Union Electric Company reports the following experience with these units:

1. After capacitors were installed, the peak loads handled by the feeder were 25 per cent greater than could otherwise have been handled successfully.

2. The installation immediately reduced voltage drop on the feeder from 7.8 volts maximum to 4.6 volts maximum, allowing a margin for increased load.

3. The capacitors have operated continuously, without requiring maintenance of any kind.

4. Because one year's carrying charges on the forestalled investment in a new feeder were sufficient to pay the total installed cost of the capacitors, the capacitors can be said to have paid for themselves each year since they were installed. Savings in line losses have bettered even this performance.

Savings for You

Overloaded substations and feeders on your system offer opportunities to release capacity at a saving with G-E Pyranol capacitors. You will find that improved voltage conditions and reduced losses are extra benefits that usually follow the installation of capacitors. Ask your G-E representative for complete information or write for GEA-2746, "Pyranol Capacitors for Central Station Applications." Address General Electric Company, Schenectady, New York.

COMPARING THE COSTS

New Feeder		Distribution Capacitors	
Circuit	$10,500	Capacitor cost (installed)	$3500
Feeder position	13,500		
Allocation of Duct Space	8,000		
Total	$32,300		
Capacity obtained	1500 kw	Capacity released	500 kw
Investment per kw	$21.50	Investment per kw	$7

Note that the carrying charges on the out-of-pocket investment for a new feeder, $24,300 (i. e., $31,300—$8,000) at 15 per cent, would have been $3645 per year, or more than the cost of the capacitors completely installed.

GENERAL ELECTRIC

360-147

Light Box Detects Damaged Bottles

After they are scalded but before they are filled, bottles at the new south side plant No. 2 of the Pepsi-Cola Bottling Company at Chicago pass between a huge magnifying glass and an opal glass panel, lighted from behind by a light box. Seen through the magnifying glass against the lighted background, the bottles appear several times normal size. Checks, cracks and chips are thus easily detected by the inspector, who can also tell at a glance if the bottles are being properly cleansed. About 120 bottles pass before the inspector per minute.

ers are standard. Current transformers of standard ratios are used in combination with the potential transformers to provide composite multipliers to the 5-amp., 100-volt, 2½-element meter. Primary meters are thus all simple multiples of the 1½-kw. rating provided by a 2½-element, 5-amp. meter.

Prospective loads were conjectural in many instances so the smaller concessions were metered on the basis of 5 watts per square foot, the medium power and light loads on the basis of 7½ watts per square foot and the large exhibits on a 10 watts per square foot basis. Experience with the connected loads as they matured indicates that these assumptions have, in general, been confirmed.

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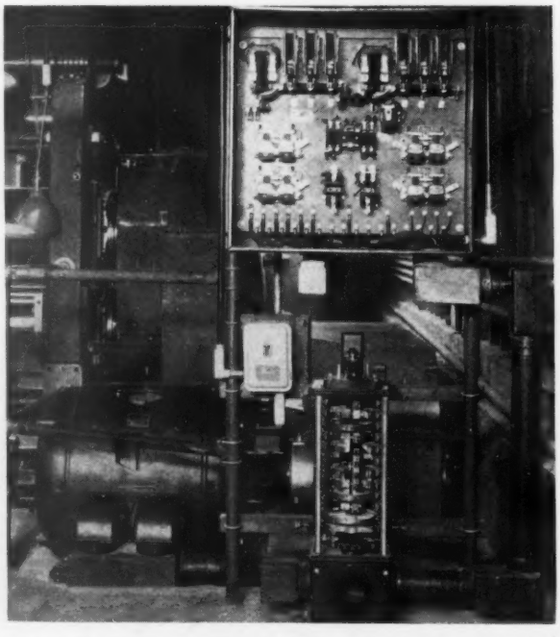
Singeing Machine Proves Successful

An electric cloth singeing machine has been designed and successfully operated by Messrs. Wm. Mycock & Sons, Ltd., Whitworth, England, to take the place of a "gassing-machine."

"The Power Service Bulletin" of the Manchester Corporation (England) describes the machine in the following manner. The heating elements consist of two separate "Glow bars," each 48 in. long by 1¾ in. in diameter. Each bar is fed by alternating current at approximately 130 volts and is heated to bright cherry red temperature when passing about 18 kw. They are clamped tight between terminals brought in on either side of the machine. Two copper cylinders, each about half an inch in thickness, rotate round the bars with a clearance of less than half an inch. Steel guide rings are shrunk on at each end of the cylinders to guide the rollers axially and prevent end play. The rollers are made of a special alloy copper, developed by the Broughton Copper Company, Ltd., so that the material will not flake off when running continuously at a bright red heat. The life of the cylinders is about twelve months, of the heating elements about four months.

The cylinders are spaced about 3 ft. apart and the cloth is brought into contact with each one by guide rollers having automatic tensioning devices. The cloth runs through the machine at a speed of about 60 yd. per minute. Cloth up to maximum width of 44 in. can be satisfactorily singed on the machine.



Drive chains and sprocket wheels are inclosed in casing behind control equipment shown with covers removed

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50-Hp. Calender Drive Occupies 139 Sq. Ft.

By JOHN H. BETTENCOURT
Plant Engineer Avon (Mass.) Sole Company

By using a double-reduction Morse chain drive from a 50-hp., 550-volt, three-phase Wagner induction motor with speed ratings of 430, 575, 870 and 1,169 r.p.m. (full load), the Avon Sole Company obtains a striking economy in space notwithstanding the inclusion of drum type and contactor control mechanism and protective sheathing of the drive in the layout.

With maximum motor speed the reduction to the main shaft of the calender is brought down to 60 r.p.m. and but 7 ft. is required between the motor shaft and the calender shaft. Between the motor shaft and the center of the shaft in the first reduction only 3 ft. is required. Over all the calender and drive with motor and control occupy a floor space of 159 x 126 in.

The calender, a Farrell-Birmingham 18 x 48-in., two-roll machine, is provided with a dynamic brake, and when the running switch is opened under emergency conditions provision is also made for reversal of the motor and roll movement.

Now a 15-kv Pyranol FILLED CURRENT TRANSFORMER

General Electric's Type KF-305

NOW, for the first time, you can get a 15-kv outdoor current transformer of the porcelain-shell type, Pyranol filled. With General Electric's new Type KF-305, these construction advantages—formerly available only in the higher ratings—have been extended to the 15-kv class.

Decreases Hazards

Pyranol is a G-E noninflammable, nonexplosive insulating liquid that is chemically stable—and the Type KF-305 is Pyranol filled. Pyranol has high dielectric strength. It will not sludge, and it presents no fire hazards. Furthermore, it's hermetically sealed in the case—no moisture can get in, no liquid can get out.

Smaller and Easy to Handle

The Type KF-305 transformer is small and easy to handle. Its porcelain-shell-type construction makes reduced dimensions possible. Its convenient shape simplifies mounting in the structural framework.

High Accuracy and Better Performance

Moreover, the new Type KF-305 meets the NEMA accuracy classification of $\frac{1}{4}X$, $\frac{1}{4}Y$, $\frac{1}{4}Z$ and the 4.5-inch impulse test-gap requirements of the ASA. These are just two of the stringent tests that these new transformers pass in order to increase your assurance of a better, more dependable transformer.

For further information on the features of these new transformers, ask for our descriptive bulletin GEA-3264. You can get a copy by calling your nearest G-E office or writing General Electric, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

420-55

NEW ENGINEERING IDEAS

Use Dry Ice to Shrink Waterwheel Bolts

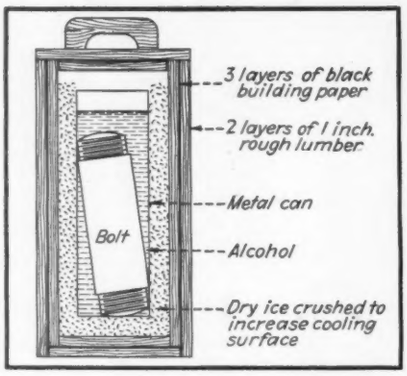
By J. C. GAYLORD
Hydro Engineer
Southern California Edison Co., Ltd.,
Los Angeles, Calif.

Time for placing 5x15½-in. fitted waterwheel bucket bolts has been reduced from four man-hours to five minutes work for three men, and the bolt is fitted with less scoring of the hole, through a procedure adopted by Southern California Edison Company. It consists of freezing the bolt with dry ice, thereby obtaining an 0.0035-in. reduction in diameter at the time the bolt is placed. Furthermore, tests showed that bolts placed in this way could be removed with 106 tons of force, whereas 168 tons was required for bolts which had been pressed into place.

"Edison" used this method first at one of its Big Creek plants for placing bolts which hold buckets to a waterwheel disk. These bolts, weighing 109 lb., are 5.030 in. in diameter, or about 0.002 in. larger than the hole in the wheel disk into which they must fit.

The bolts were placed in a close-fitting can of alcohol and packed in a dry-ice cabinet. Alcohol was selected as a heat-transfer medium because it remains liquid at the temperature of dry ice (−109.6 deg. F.) and because it forms a coating which prevents formation of frost on the refrigerated bolt if the time for getting it into place does not exceed approximately 15 seconds.

In 2½ hours the bolt diameter is decreased by 0.0035 in. In addition the hole is expanded 0.0015 in. by heating to about 120 deg. F. with an oxyacetylene torch. Thus 0.003 in. of working clearance is obtained. Before the bolt is placed the hole is swabbed out with a mixture of kerosene and white lead, the latter because it remains soft for years.


3 layers of black building paper
2 layers of 1 inch rough lumber
Metal can
Bolt
Alcohol
Dry ice crushed to increase cooling surface

Container used for holding turbine bolt while subject to cooling by dry ice

It has subsequently been found that chilling time can be reduced by placing the dry ice directly in the alcohol. Escaping gas bubbles agitate the liquid, improving heat transfer.

The benefits of shrink-fitting decrease with bolt diameter because the amount of contraction that can be obtained decreases proportionately, whereas the necessary working clearance remains about constant at 0.002 in. However, the method has been successfully applied to 3¼-in. bolts.

•

Photometry at Low Field Luminosity

At low field luminosities the use of photoelectric equipment finds increasing justification when very high sensitivity is necessary. In a recent paper entitled "Photoelectric Photometer for Rapid Comparison of Two Light Sources," by F. A. Ryder, J. T. Gier and L. M. K. Boelter, presented before the Illuminating Engineering Society, a photoelectric instrument which has proved to be of value was described.

The flux enters an aperture in a sphere, is reflected from a diffuse reflector and illuminates the white inner wall of the sphere. The photoelectric current varies according to the luminosity of the inner wall. Synchronized sector disks moving at the speed of about 2 r.p.m. are placed close to the sphere and hence the wave shape depends only on the relative dimensions of the aperture and an arc which is the dimension along the aperture kept constant by means of an adjustable jaw. A single-stage amplifier is mounted in a metal housing directly above the sphere. The amplifier includes a low-pass filter which increases the signal-to-noise ratio, since the random noise voltage covers a wide spectrum. The preamplifier is coupled to another amplifier and thence to a cathode-ray oscilloscope. The device, with the exception of the second amplifier and the oscilloscope, is self-contained and is mounted on a carriage which may be moved along the bench.

The indicating instrument used for development work on the photometer is the cathode-ray oscilloscope. With this instrument a photometric match is indicated by the disappearance of the wave trace on the screen, the effects of phase shift or non-similarity in wave form by lack of complete disappearance of the trace on the screen, the advantage of ruggedness of the tube allowing very high amplification and hence high sensitivity without regard to damage to the indicating device under conditions of mismatch. However, there is the disadvantage of large voltage amplification compared to an amplifier employing a very sensitive galvanometer. But unless the unbalance voltage

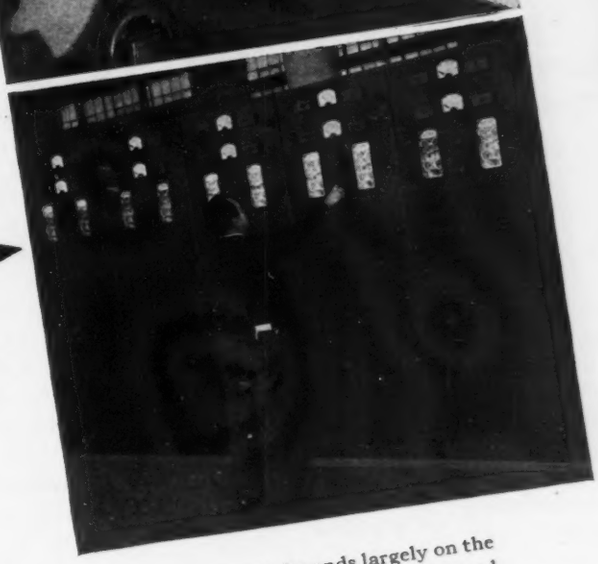
HE REALIZES THE IMPORTANCE OF "IC"

That's Why He's Installing G-E Air Circuit Breakers on All Branch Circuits

BESIDES adequate interrupting capacity ("I C"), G-E air circuit breakers provide overcurrent protection, with adjustable time delay. And you can restore service at once, safely, just by turning a handle. By providing three-phase interruption, single-phasing of motors, with all its harmful effects, is prevented. Because of their trip-free action, these circuit breakers cannot be held closed against short circuits. They are designed for interrupting ratings up to 80,000 amp.

For Main Circuits He Bought G-E Air Circuit Breakers Assembled as a Completely Enclosed Switchboard

This assembly of G-E air circuit breakers is installed as a unit. All you need do is to connect the leads. Being completely dead-front, it offers the advantage of safety over old-fashioned boards that have exposed live parts.



THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices. Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

GENERAL ELECTRIC

890-80D

890-87

OF INTEREST TO POWER SALESMEN

This is one of a series of G-E advertisements appearing currently in six industrial trade journals to impress upon electrical engineers and maintenance men the importance of having protective devices with adequate interrupting capacity on their main and branch feeders.

is intended to provide automatic adjustment of the standard lamp, there appears to be no advantage in the synchronous rectification and direct-current galvanometer system.

Sensitivity of this device is lower than that of other systems, but it is superior in every other respect. Another problem presented is the deviation of the spectral response from the desired function. It is hoped that after more study a photocell of constant spectral response will be produced which in conjunction with a filter would yield a reasonably close approach to the standard selectivity curve.

•

Pole Riser Cable Uses "Neoprene"

By E. D. YOUMANS*
The Okonite Company

Since early in 1937 we have been investigating a single-conductor, non-shielded, non-metallic sheathed cable design for 5,000-volt pole riser service which is made with ozone-resistant rubber insulation with a sheath of "Neoprene" applied directly over the insulation and bonded firmly thereto. The results obtained in extensive laboratory tests, in experimental installations in our factory proving ground, and in what is as yet rather limited service experience are encouraging. The cable does not develop corona discharge at 5,000 volts or less between phases, even under the most severe wet conditions.

The neoprene sheath is made with approximately 60 per cent by weight of neoprene, Du Pont's synthetic rubber-like product. It contains no natural rubber. The neoprene sheath has excellent ozone resistance and aging properties.

All that we have learned in the past two years about the ozone-resistant, rubber-insulated, neoprene sheathed design indicates that it provides a non-shielded, non-metallic sheathed single-conductor cable satisfactory for pole riser service at voltages up to 5,000 volts between phases. This cable can be manufactured at a reasonable cost, so that when the fact that potheads are not required for terminating is considered, it answers the demand for economy in pole-riser installations. It is evident from the description of the characteristics of this cable that it also has possibilities for many other applications such as in underground ducts and in stations and substations where braid-covered cables have given trouble or been a cause of concern due to corona discharge or ozone.

Pole-riser cables are usually installed in steel pipe which is buried direct in the earth to the base of the pole and continued on up the pole for a distance of from 12 to 18 ft. From the top of the steel pipe the cables are protected by fibre duct or wooden trunking up to the cross-arms, where they are fanned out for connections. No attempt is made to suspend the cables in the conduit and they support themselves by contact with one another and with the inner surface of the conduit. The cables are fastened individually to the cross-arms by means of ordinary pipe cleats. It is good practice to wrap these cleats with rubber and friction tapes where they are in contact with the cables. The ends of the neoprene-sheathed cables are terminated simply by removing the rubber insulation and sheath as a unit from the conductors for the distance required for application of the lug. There is no need for an exposed section of bare rubber insulation in the terminating of the neoprene-sheathed cables, such as is required for braid-covered cables in order to prevent leakage from the conductor. If the conductor ends are exposed it is desirable to wrap over the end of the neoprene sheath and fill in between the insulation and the lug and on over the lug for a space with a good quality rubber splicing tape in order to seal moisture out of stranded conductors. A high-grade friction tape should be applied over the rubber tape and coated with a suitable cable paint.

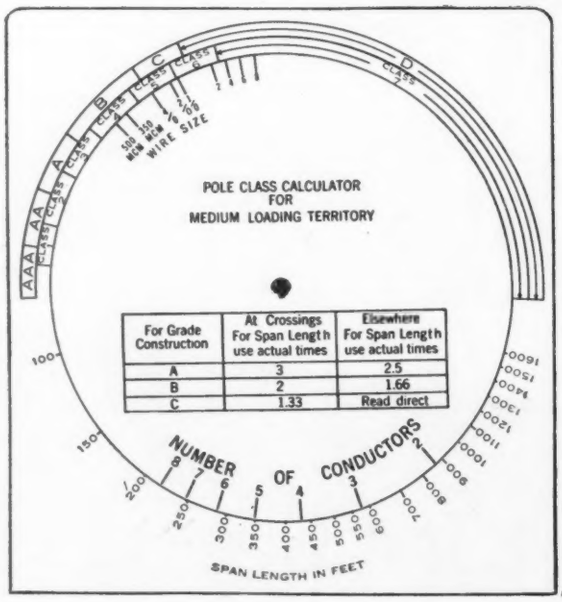
The top of the conduit on the pole should be closed so as to prevent water running down the cables. Generally this is done by packing oakum in around the cables at the top of conduit and then using an asphalt sealing compound on top of the oakum. One electric light and power company that we know of, in an effort to overcome troubles that have been experienced with braid-covered riser cables due to corona discharge in the vertical section of the run, has developed a special fitting for the top of the steel pipe which permits ventilation. This should help to reduce the moisture content in the pipe, but is expensive and should not be necessary with the neoprene-sheathed cable.

It is good practice, and one which many follow, to use the same cable construction for the neutral as for the phase conductors. This provides for safety by keeping grounded metal off the upper section of the pole.

Satisfactory methods of splicing the single-conductor, neoprene-sheathed cables have been developed, including the jointing of three or four such cables to a three- or four-conductor paper and lead cable.

*Abstract of paper, Missouri Valley Engineering Conference.

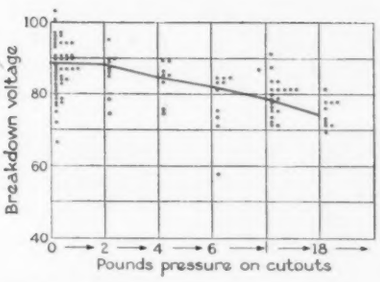
Pole Class Calculator for Straight Lines



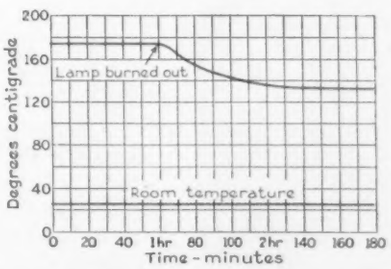
Based on triple-braided weatherproof copper wire with all conductors on one arm at top of pole, this calculator indicates the class pole required for straight construction in medium or heavy (reverse side of calculator) loading territory. Applied to bare wire or line with two or more arms, it may indicate a pole one class heavier than would be needed, but in no case a pole too small for Code requirements. It reads directly for Class C construction; table on either side of calculator lists factors of safety for other grades and railroad crossings. Bell Lumber & Pole Co., Minneapolis, Minn., offers it to interested utilities. Vernon W. Palen, Northern States Power Company, developed the calculator.

4 FACTS ABOUT Street-lighting Cutouts

A Story of How G-E Film Cutouts Reduce Unnecessary Service



1 G-E copper-oxide-film cutouts can eliminate many street-lighting service trips because they break down at their *rated* voltage. This has been proved by careful tests conducted under operating conditions. The curve shown above indicates the results of these breakdown-voltage tests of G-E low-voltage-type cutouts. Tests of G-E cutouts of different ratings show the same narrow range of breakdown.



2 Lamp-socket clips holding G-E cutouts operate at a reduced temperature after the cutouts break down. This has been proved by tests that were made to study the possibility that socket damage might result from the heating of a cutout. The results of the tests are shown in the curve above—clips holding G-E cutouts actually *cool* more than 40 C after the cutouts break down.

3 G-E cutouts are mechanically strong. Even after being carried around loose in a lineman's pocket, they will operate properly at their rated voltage.

The color of the fiber disk on each cutout (black, brown, or red) indicates its rating—a service man need never wonder whether he is installing the correctly rated cutout.

4 A report recently received from a large operating company shows that G-E cutouts will minimize breakdowns that are due to voltage surges. This company had been experiencing considerable trouble because cutouts were breaking down from lightning disturbances—between 500 and 600 were needlessly breaking down each year. A change was made—G-E cutouts were installed, and since that time, breakdowns have been "negligible."

The breakdown voltage of a copper-oxide film of the type used in G-E cutouts increases with the steepness of the wave front. This characteristic helps protect G-E cutouts from excessive breakdowns due to voltage surges of any kind.

If you aren't using G-E film cutouts for street lighting, why not install them on a few circuits and then compare the results with those you obtain from the cutouts you are using now?

For further information call the nearest G-E sales office, or write General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

500-364

LOAD BUILDING

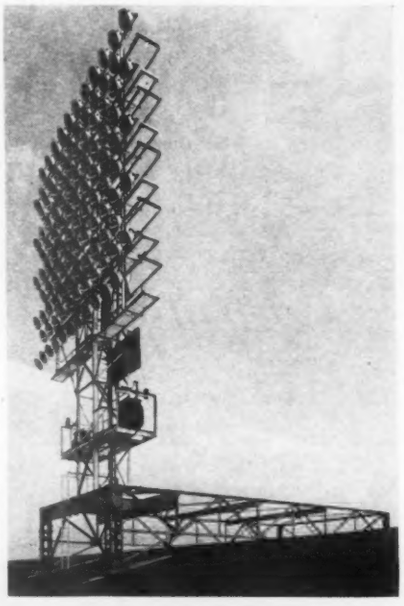
360 Ft.-Candles for Shibe's Pitchers

Under total floodlighting load of 1,357 kw. Connie Mack's pitchers now wind up in 360 ft.-candles of illumination facing batters bathed in 181 ft.-candles at home plate. The close-in, fast play area has an average intensity of over 225 ft.-candles.

The light gradually shades off in the outfield to drop to an average intensity of about 120 ft.-candles at ground level. The lights are so focused that the lighting intensity in the air over the field of play is even greater, giving every opportunity for both players and spectators to follow the ball easily.

To provide this new high in baseball illumination Utilities Engineering Company erected eight field towers, two on each side of the square. The two towers in right field were built from the ground up and the six others are erected on cantilever sections above the grandstand and bleacher roofs. The towers are 157 ft. from the ground to the tip of the lightning arresters and no lights are less than 120 ft. from the ground.

A total of 780 20-in. inclosed Westinghouse Alzac floodlight projectors are mounted on these towers. The two banks of lights which flank home-plate contain only 60 units each. The six other towers have 110 units each. Each floodlight is equipped with a 1,500-watt, 105-volt lamp which operates at 115 volts, thus increasing light output 35 per cent and wattage input only 16 per cent. Provisions have been made for the addition of 80 more units if greater intensity of illumination should be desired in the future.



Two-billion-beam candlepower
This system makes Shibe Park, served by Philadelphia Electric, one of the best-lighted sports fields in the world. Night view shows pitcher in 360 ft.-candles and equally high surrounding intensitites. Day view is of one of eight towers equipped with Westinghouse 1,500-watt floodlights.

The Pros and Cons of Radiant Heating

Summarizing experience with the application of infra-red heat lamps in industry at a meeting of the Great Lakes Power Club recently G. M. Allen, power salesman of the Detroit Edison Company, enumerated the following fundamental conclusions regarding proper use of this radiant heat source:

1. Infra-red is generally satisfactory in the lacquer drying field, where time is important.

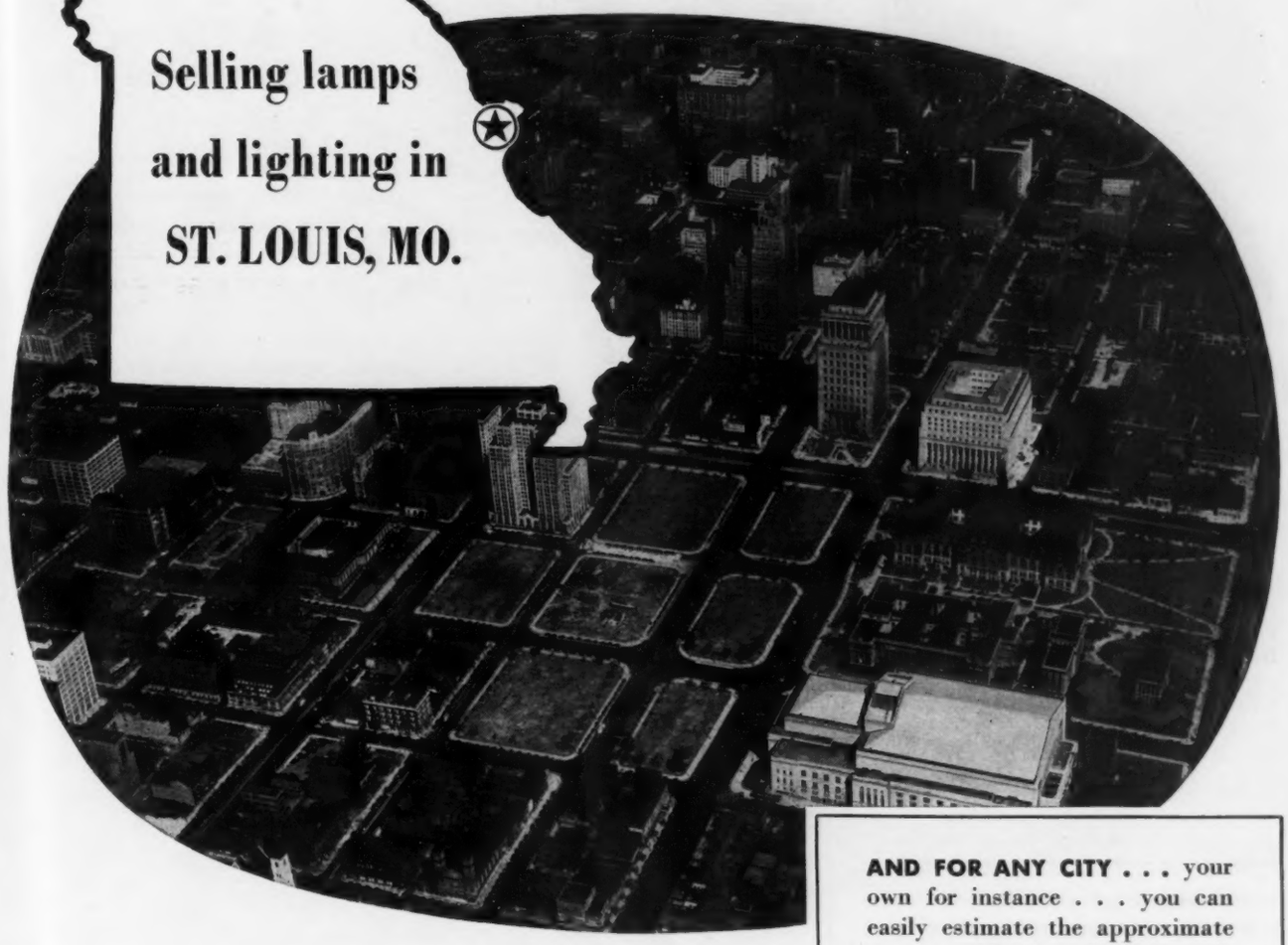
2. Reasonable success can be expected in the enamel drying field when (a) enamel formula is under control, (b) reflection factor is not too high, (c) application is adaptable to radiant forms of heating.

3. Little success can be expected in drying japans and oil-base house paints.

4. Moisture drying has possibilities

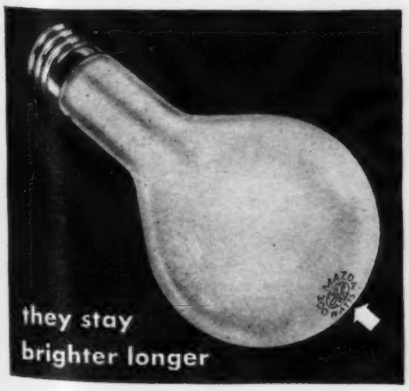
Selling lamps and lighting in ST. LOUIS, MO.

View of St. Louis, population 927,516.
Photo courtesy of St. Louis Chamber of Commerce



HERE'S a quick picture of the way General Electric advertising is constantly at work in St. Louis, promoting light-conditioning for Better Light-Better Sight. Into St. Louis homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to approximately 36 impressions per person in the last ten years.

IN 1939 . . . 2,640,000 magazines with G-E lamp advertisements and 1,045,000 radio messages.



SINCE 1929 . . . 27,720,000 magazines with G-E lamp advertisements.

FALL 1938 . . . 1,477,000 copies of St. Louis newspapers with G-E lamp advertisements.

LAST 3 YEARS . . 2,382,000 newspapers with G-E lamp advertisements.

SINCE 1929 . . . 34,281,000 advertisements in magazines, newspapers, and radio . . . which is approximately 36 advertisements per capita.

AND FOR ANY CITY . . . your own for instance . . . you can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

Going into the average wired home in 1939

14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages

24 total advertising messages

• • •

In the last 10 years, the average wired home received

158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages

208 total advertising messages

G-E MAZDA LAMPS

GENERAL ELECTRIC

Courtesy Commonwealth Edison Company

Inspection of the color and pattern on punch boards made by C. A. Brewer & Sons, Chicago, Ill., is much easier and more critical under the 40 ft.-candles of "daylight" fluorescent light now provided than under incandescent light formerly used alone. A single 30-watt, 36-in. daylight fluorescent lamp is used. It is mounted 4 ft. above and 1 ft. back from the edge of the inspection table. This unit is used in addition to the 200-watt "mill" type reflectors which were used previously.

when the amount of moisture is not too great and where it improves the product or the production method.

5. Successful mass heating depends upon the shape of the mass, the relation of surface to volume and the advantages other than fuel costs—such as improvements in the product or in production methods.

Bearing out these conclusions a number of specific applications of radiant heat were analyzed and probable reasons given for success or failure.

Several Cases

The Detroit Edison Company has experimented with the use of infra-red heat in *reconditioning power cable.* After repair is complete grease is applied to the cable sheath and heat is necessary. A torch was found to corrode the sheath. A fuel-fired oven was too slow. Infra-red heat eliminates both disadvantages and is very flexible.

For heating a large mass with a comparatively small surface area, infra-red heat appears to have advantages. Very encouraging results are reported by a motor repair concern using a 7-kw. installation for *baking small transformers and motors.* It claims that infra-red will bake units in one-third the time formerly required with a fuel-fired oven and also cuts operating costs.

Radiant heating ordinarily fits in nicely with production methods except when attempts are made to heat irregularly shaped pieces or parts containing a number of holes. Attempts to "set up" the compound in *automobile gaskets* failed, although the compound set quickly, because of excessive heat loss through the open parts of the gaskets which were handled in large volume.

Infra-red heating generally does a superior job of *lacquer drying,* speeding up the process at low cost with complete safety. Because it is a low-temperature drying operation, 100 to 130 deg. F., air drying is widely used. Higher temperatures cause bubbling and pinhole effects from boiling of the solvent.

Reasonable success has been experienced with *enamel drying.* The baking range is 250 to 450 deg. Organic pigments tend to discolor in this range. Film temperatures with infra-red are ordinarily higher than with other type ovens. Amount of dryer used is very important—if too much is used the finish will not last.

Attempts made to *bake white enamel* for two companies failed. With the enamels used competitive types of heat could not be met because (1) enamel used was not a good "infra-red formula" and (2) reflection factor was too high.

Attempts to use infra-red for *drying oil-base paints* similar to those used for house paints also failed. Similarly, little success has been had in *drying printer's inks.* In spite of the term "drying" applied to these inks they set by an oxidation and polymerization process similar to oil-base paints. Vaporin and aniline inks, however, will dry satisfactorily.

A few installations have been encountered where infra-red heat could be economically used for *moisture drying* where amounts of moisture were small. Small installations in two envelope firms for drying the gum flaps were very successful. Lamps dried the gum flap faster than the fuel ovens formerly used and without troublesome curling.

Evaporation of large amounts of moisture has not worked out well. Prohibitive amounts of power were required to dry out the board of a gypsum company now using fuel kilns. Similarly, it was impossible to meet fuel competition for drying *sheet steel* after pickling. Odd size sheets were being treated, resulting in appreciable losses with radiant drying, and production set-up could not be devised to make use of the advantages of infra-red heating.

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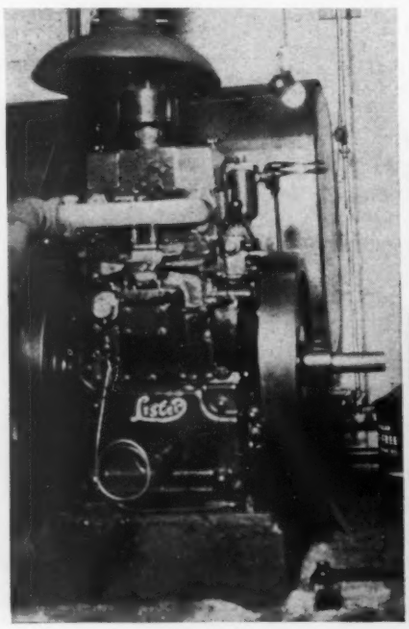
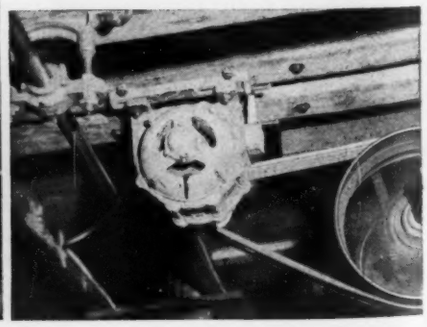
Repair Bills Retire 3-Year Old Diesel

By L. M. DURYEE
Industrial Power Engineer
Connecticut Light & Power Company, Waterbury

John Villano, progressive owner of the Bar-Work Manufacturing Company, Railroad Hill Street, Waterbury, has a Diesel engine three years old. Repair bills became excessive, so in the spring of 1938 Mr. Villano ordered three-phase power service and wiring, and installed motors to supplement the Diesel. Then, last August, due to serious engine interruptions, he shut down the engine completely, and has been running his plant permanently on purchased power ever since. He made this decision in order to eliminate the high repair bills on the engine and to obtain continuous production on his machines. Main difficulties with isolated power: Slowing up in speed on hot summer days, reduced production and profits, lost time for the help, excessively high repair bills. Mr. Villano is now a confirmed believer in purchased power.

The photos show the 14-hp. engine on the day it was permanently shut down, also the motor that replaced it. Mr. Villano reports that he is very well pleased with purchased power after his experience with the engine and that he now devotes his full time to filling orders for delivery to his customers. All sorts of automatic screw-machine products are made here, which require constant speed drive and uninterrupted service. Thus the change!





Before and after reliable supply of power replaces isolated plant shown at left; 14-hp. Diesel resulted in reduced production and profit, lost time for help and high repair bills.

PROTECT WIRING SYSTEMS WITH G-E WHITE

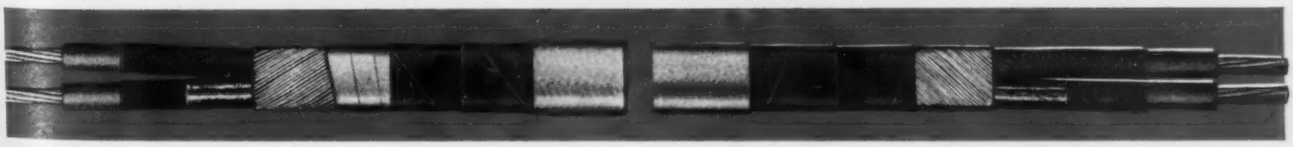
LONG-LIFE RIGID CONDUIT

Resistant to Heat, Flame, Gas, Acids, Alkalies, and Moisture

Resistant to Corrosion and Mechanical Injury

Here is a quality conduit which can be depended upon for enduring service. G-E White Rigid Conduit is made of "rimmed" steel. It is hot-dipped galvanized and Glyptal coated inside and out. It is easy to bend and install. It has clean accurate threads. There is a complete line of G-E Boxes and Fittings available.

IMPROVED SERVICE ENTRANCE CABLE TYPE SE, STYLE A AND STYLE U



This service entrance cable is flexible without sacrifice of quality. It can be bent edgewise easily for neat installations. Conductors move independently under wrap when cable is bent. Cellophane prevents "black" conductor from bleeding on "red" conductor.

For further information about G-E White Rigid Conduit or about G-E Service Entrance Cable, see the nearest G-E Merchandise Distributor or write to Section C-9119, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

NEW EQUIPMENT

Wattmeter

Because standard single-phase portable wattmeters as used by electrical repair men are not suited, a convenient "Appliance" wattmeter is offered whereby the appliance

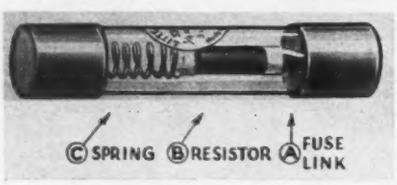
Steel Six "Appliance" Wattmeter; two ranges, 0-250 watts, 0-750 watts; 110 and 220 volts; instrument 6 in. square by 4 in. deep. **Roller-Smith Co.**, Bethlehem, Pa.

plug can be inserted in the socket marked load on the wattmeter. A rubber-covered set of leads connects the line side of the instrument with the outlet. To shift from one range to the other depress the push button on the side of the instrument case.

•

"Slo-Blo" Fuses

To blow, but not needlessly, is the object of a new dual-purpose fuse having a simple fuse link and a resistor element



"Slo-Blo" fuses; in 3 AG size, 1¼ in. long, ¼ in. in diameter; ranges between 1 and 1/100 amp. **Littlefuse, Inc.**, Chicago, Ill.

providing heat inertia or time lag. On severe overloads, fuse link (A) melts as a conventional fuse. But on prolonged overloads, resistor (B) heats up and melts fusible alloy connecting to (A). Spring (C) serves not only to open circuit but also to take up expansion of (A), preventing crystallization on repeated heating or cooling. Suggested applications include motors, vibrator circuits, intermittent control circuits, coils, solenoids, magnets and relays.

•

Ceiling Switch

Ceiling pull switch, 10 amp., 125 volts; 5 amp. 250 volts; outlet box cover 3¼x4 in. **Arrow-Hart & Hegeman Electric Co.**, Hartford, Conn.

Because of Bakelite covers fastened by one center screw, these switches are claimed to be preferred where moisture or other atmospheric conditions affect metal switch covers.

•

Cord Connections

Plug and Strain Reliever Socket, **Eastman Mfg. Co.**, Manitowoc, Wis.

A heavy rubber plug is designed with a rubber "neck" extending over the cord. A steel clamp is tightened about the "neck" to join the unit tightly and absorb the strain carried by the terminal screws. A special clamp is fastened into the socket insulator unit, screwing in place directly over the cord. This eliminates danger of cord and socket pulling apart.

•

Electrical Connector

Electrical connector for flat bar, Type FE. **Burndy Engineering Co., Inc.**, 459 East 133d St., New York.

Designed to join laminated flat bars to tube or cable, this connector is claimed to have a construction guaranteed for high conductivity and accurate dimensions. The leaves are pure cold-rolled copper bars solidly cast in the copper alloy body by a special method.

•

Automatic Starter

Type R, class 8536 starter; maximum polyphase, 2 hp., 220 440, 550 volts; maximum single phase, 1 hp., 220 volts; 1½ hp., 220 volts. **Square D Co.**, Milwaukee, Wis.

For smaller sizes of polyphase and single-phase motors, this starter has vertically operating magnet, double-break silver contacts and thermal overload relays. Offered with dust-tight, water-tight inclosures, as combination starter with either disconnect switch or circuit breaker; also in reversing type.

Polaroid Drafting Lamp

This lamp is designed to give glareless Polaroid illumination of ample brightness over any drawing board, inspection bench or desk up to 5 ft. long. It consists of

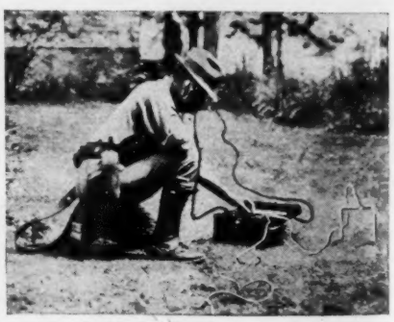
Polaroid drafting lamp; 36 in. long x 5½ in. wide x 7½ in. deep, weighs 19 lb., uses three 75-watt bulbs, inside frosted. **Polaroid Corp.**, Boston, Mass.

pressed steel construction, with cast-iron base, by which it is attached to the underside of the drafting table with screws, and a tubular steel shaft. The lamp is fitted with a full-length window of Polaroid light-control film and is adequately ventilated. The back is easily removed for relamping.

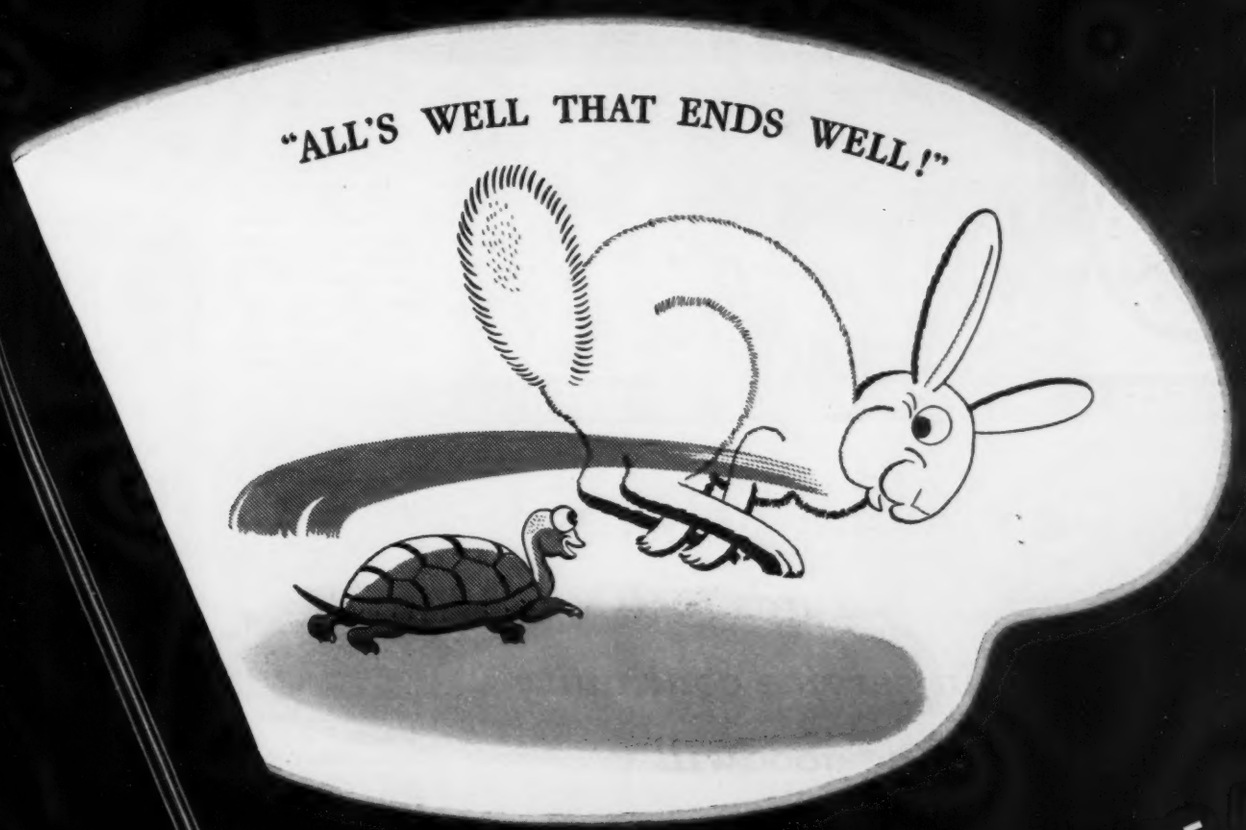
•

Groundometers

Compact and completely housed in a steel case, this meter is suitable for line construction crews to measure resistance of



Type "T" groundometer; each electrode resistance 5-500 ohms; outside dimensions 13 in. long x 7.5 in. wide x 8.5 in. high; weighs 13 lb. with accessories. **Borden Electric Co.**, Summit, N. J.



AND THE BEST ENDING OF ALL

FOR YOUR TRANSMISSION AND DISTRIBUTION LINES IS A SAFE ANCHORAGE ON THE NEW TWO-WAY HUBBARD HERCULES EXPANDING ANCHOR. WRITE FOR INFORMATION!

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

Radio Telephone helps you

1. *to eliminate hazards faster*
2. *to maintain service continuity*
3. *to build public goodwill*

When emergencies strike, restore service *fast*—with the aid of Western Electric Radio Telephone. You reach repair crews at once. They can call for supplies, report to you the minute a line is clear.

No matter whether you serve a large or a small area, Western Electric has the right radio telephone to cover it. This equipment is built for years of trouble-free service under your conditions.

It's made by the makers of Bell Telephones—backed by years of experience in making radio equipment for airlines, police, ships-at-sea and broadcasting stations.

For full information write to Graybar Electric Co., Graybar Building, New York City.

Distributed by GraybaR

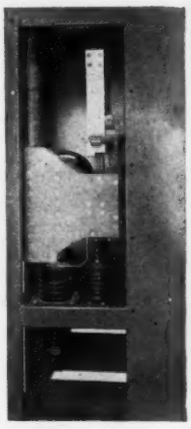
Western Electric
RADIO TELEPHONE EQUIPMENT

lightning arrester grounds. Six flashlight cells are housed in metal tubes, their leads passing through a rubber grommet to the inside of the compartment, where they are soldered into the circuit. Face plate is aluminum and the vibrator fuse and binding posts are mounted on a panel. An earphone is connected into the circuit through the left side of the face plate. Meter is provided with an X ohm scale for a direct reading of the resistance of X ground. Accessories are two duplex electrodes, a set of three test leads and a ground clamp.

•

Circuit Breaker

"Air-blast" breaker; 15,000 volts; interrupting ratings 500,000-1,500,000 kva.; operates on air compressed to 150 lb. **General Electric Co.**, Schenectady, N. Y.



Adapted especially well to modern station type cubicle arrangement of switchgear, this breaker has a special interrupting unit for each phase with its air-blast chamber of fan-like design. Arc splitters of insulating material form four separate chutes within the chamber. Metallic cooling plates aid in dissipating the heat. The main contact is silver surfaced and the arcing contact is made of special heat-resisting alloy. An electrical impulse supplies air to the closing side of the main cylinder, causing the piston to move downward and close the contacts. In the opening this impulse to an airblast pilot valve opens a pilot, thus closing the switch to the opening trip coil. A timing switch cuts off the air blast when the contacts have parted.

•

Multi-Breaker

"MO Multi-Breaker," rated from 15 to 25 amp. **Cutler-Hammer, Inc.**, Milwaukee, Wis.

Installed wherever fused type switches are employed, this "Multi-Breaker" service control can be easily reset by means of a small lever whenever overloads and short circuits cause fuse blow-outs. It is designed for use in the home, shop, commercial building or farm as an entrance or service switch with overload and short circuit protection on lighting circuits, oil burners, stokers, etc.

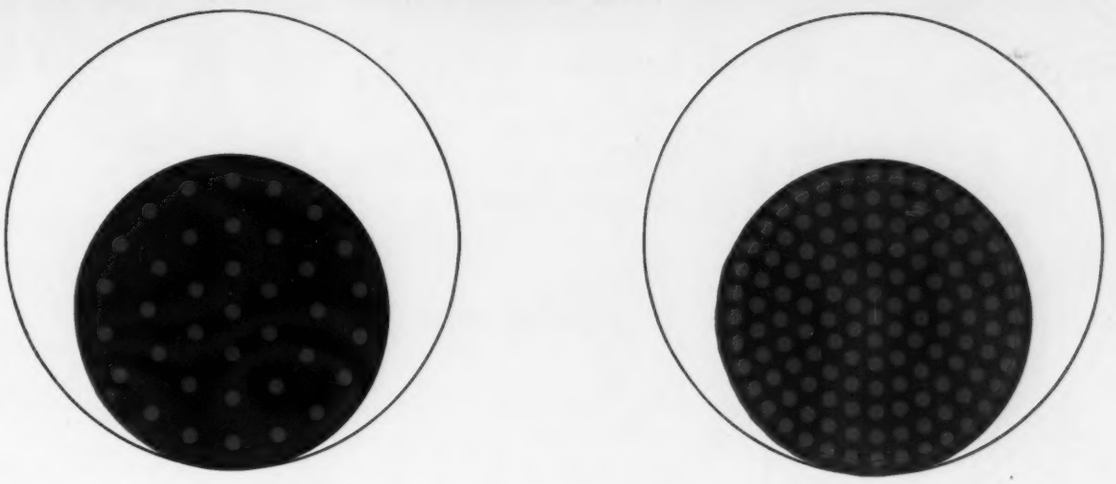
•

Resistor

FL resistor for d.c. operation of fluorescent lamps; total weight less than 12 ounces, over-all box dimensions about 6⅜x1¾x1¼ in. **International Resistance Co.**, Philadelphia, Pa.

This new IRC resistor is specifically designed for approved auxiliaries for d.c. operation of fluorescent lamps. They are so constructed as to provide maxmium heat dissipation in minimum space. This type is insulated wire wound with 1,250-volt insulation, operating at a temperature rise

More Conductors . . . — Better Insulation



In these two drawings we have a purely hypothetical case which shows the tremendous savings possible by using Simplex-LATOX insulated cables. It is possible to get 127 No. 12 solid LATOX insulated conductors into a conduit and not take up any more space than 37 No. 12 solid conductors insulated in the ordinary way.

Conductors insulated with conventional rubber insulation fill up ducts in a hurry. These cables have thick conductor walls and it only takes a few of these conductors to fill an ordinary size conduit. LATOX cables on the other hand are small - 30 to 50% smaller than ordinary cables.

When you use Simplex-LATOX cables you can use every allowable bit of space in your conduits. There is no waste space with LATOX cables. Simplex-LATOX rubber insulation – used in all Simplex-LATOX cables – was developed in Simplex laboratories to meet a definite need caused by the conditions under which you work today. It was designed to reduce weight and bulk and at the same time improve those physical and electrical properties necessary for efficient conductor insulation.

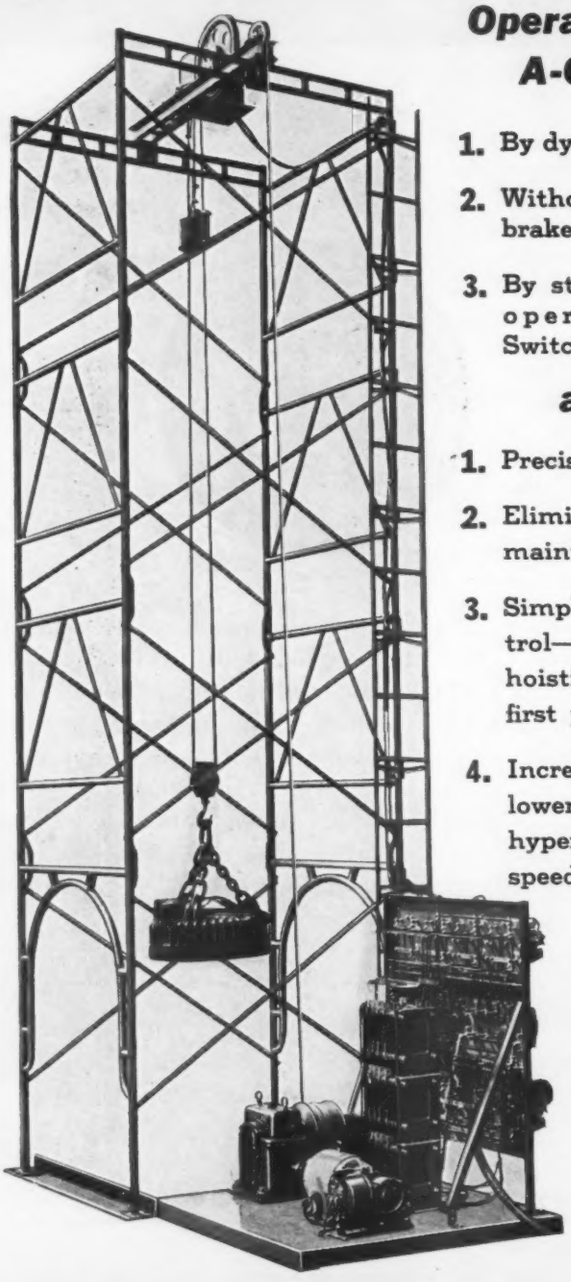
The advantages of lighter weight and smaller diameter are combined with the higher electrical and physical properties that LATOX insulation provides to give ideal performance for communication, signal and control cables.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex – LATOX

Thin insulation made directly from rubber latex

EC&M
Announces—
DYNAMIC LOWERING CONTROL
for A-C CRANE HOISTS



Operate your
A-C Cranes now

1. By dynamic braking
2. Without mechanical load-brake
3. By standard sequence of operation of Master Switch

and obtain

1. Precision inching
2. Elimination of load-brake maintenance
3. Simple master switch control—both lowering and hoisting motions start on first point of master
4. Increased crane output by lowering heavy loads at hyper-synchronous (150%) speed

This Test-Hoist, complete with motor, controller, etc., will be in operation at Pittsburgh. Various loads will be available to demonstrate actual working conditions found in foundry, machine-shop, material-handling, erection and similar crane-service.

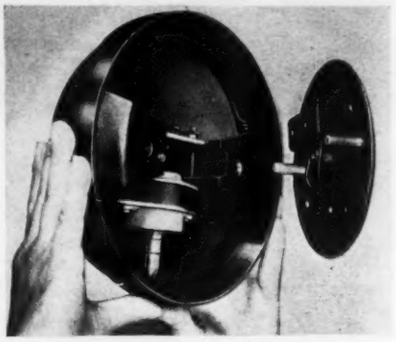
Examine and operate this outstanding Control at
IRON & STEEL SHOW PITTSBURGH, Sept. 26 to 29

of about 40 to 50 deg. C. Metal boxes of special ventilated construction are made small enough to fit in any fixture channel.

•

Signal Bell

This bell has a simple mechanism because it contains only one moving part—the striking plunger—made possible by using a high-magnetic alloy, "Alnico." The motor is small and compact, completely inclosed and air sealed for protection



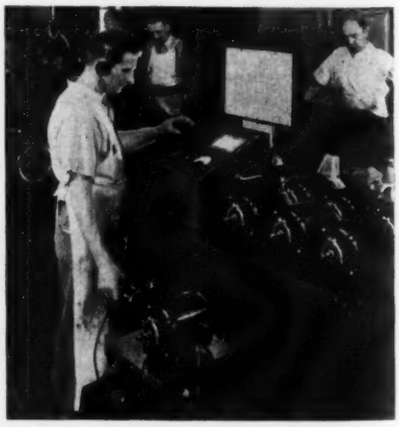
"Connectabell;" a.c. and d.c., sizes 4 to 16 in. **Connecticut Telephone & Electric Corp.**, Meriden, Conn.

against insects or weather. The bell can be mounted easily and quickly on standard outlet boxes by fastening the detachable back plate to the wall outlet and connecting the wires to the screw terminals. The bell unit is then plugged into the receptacle on the back plate. Designed primarily for high voltages, but also made for low-voltages, it is widely adaptable to all types of fire, burglar, sprinkler and vault alarms.

•

Noise Analyzer

An electrical "tin ear," this device measures the intensity of sound by picking up any sound, amplifying and filtering out all but one preselected pitch and measures the volume and loudness of this pitch on a calibrated meter through headphones. The



"Industrial Noise Analyzer;" operates off 110 volts, 60 cycles, taking 40 watts; low-pass filter, 50-cycle cut-off; high pass, 4,800-cycle cut-off; 15 db. range. **Electrical Research Products, Inc.**, 195 Broadway, New York.

analyzer consist of a microphone, the electrical wave filters, the amplifier and meter, which gives the visual indication of the band being tested.

TECHNICAL BULLETINS

NICKEL ALLOY STEELS—A revised form of its "Hardness Conversion Table for Nickel Alloy Steels" is available on request to the International Nickel Co., 67 Wall St., New York, N. Y. On the reverse side of this pocket-size celluloid card are listed the S.A.E. standard specifications for nickel alloy steels.

LIGHTNING ARRESTERS—An engineering section makes up the first half of Catalog No. 404 of Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia, Pa. Such topics as lightning protection for distribution systems, interconnection, transformer failure due to lightning, primary fuse protection, lightning protection for rural lines, performance characteristics and general theory of operation of lightning arresters are discussed. Catalog information on the "Crystal Valve" lightning arrester is included in the second portion of the book.

MAGNET WIRE—A new edition of its Magnet Wire Catalog has been published by Anaconda Wire & Cable Co., Advertising Division, 25 Broadway, New York, N. Y. Greater information is given on magnet wire, electrical and physical properties and more space devoted to magnet wire coils. Also available is a small-size pocket handbook containing technical tables of information to the engineer.

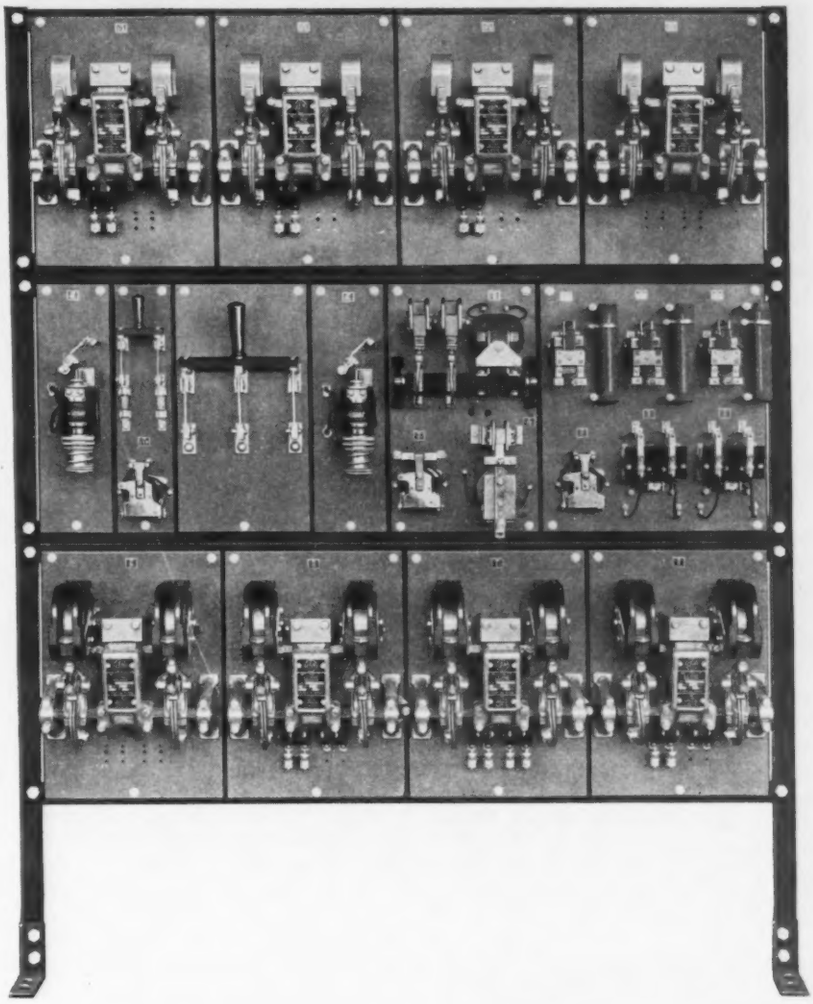
ANCHOR RODS AND EYE-BOLTS—Suggestions for Specifications for Anchor Rods, publication TD-2, and Suggestions for Specifications for Eye-Bolts, TD-4, as approved by the transmission and distribution committee of the Edison Electric Institute, may be secured from E.E.I. headquarters, 420 Lexington Ave., New York, N. Y.

REFRIGERATING MACHINERY—Refrigerating machinery standards supplementing the equipment standards published in 1938 by the Refrigerating Machinery Association have been announced. Under the title "Equipment Standards Supplement 'A,'" this 14-page addition lists the major headings of base specifications for self-contained ammonia units; ammonia brine cooler ratings; Freon-12 mains; standard nomenclature for reciprocating compressors. Copies are available at the association's offices, Southern Bldg., Washington, D. C., at 25 cents the single copy.

POWER TRANSMISSION—Data on the selection of the proper belt, installation, speed of operation, pulley size, tension, carrying capacity, as well as numerous types of transmission drives and conveyor layouts, together with suggestions for improving belting methods, are included in "Belting Biographies," published by the Mechanical Division, United States Rubber Co., 1790 Broadway, New York, N. Y.

SEAMLESS TUBING—The Babcock & Wilcox Tube Co., Beaver Falls, Pa., has recently published two technical bulletins. No. 15 gives weights per foot for minimum wall and average wall tubes, hot-finished and cold-drawn, ranging in size from $\frac{1}{8}$ in o.d. with 36 B.W.G. wall to $10\frac{3}{4}$ in. o.d. and $1\frac{5}{8}$ in. wall thickness inclusive. Bulletin 11-B contains specifications established for carbon steel and alloy steel tubes by the A.S.T.M. and the Association of American Railways and specifications of the manufacturer for high chrome and stainless steel alloys.

This is a typical EC&M Dynamic Lowering Controller for Hoist Motion of A-C Crane



At last—perfected crane control for A-C motor driven hoists, developed by EC&M, the originators of dynamic braking control for D-C cranes in 1912. Now—it is also possible to operate A-C cranes by dynamic braking, permitting low cost and precise operation. With this control, there is no mechanical load brake to wear and require attention; instead, the load is raised and lowered directly by the motor and control using A-C power only.

In inching operations, the short movements of the crane hook possible with this control will surprise you. And when lowering heavy over-hauling loads, the use of hyper-synchronous speeds (as much as 50% faster than previously obtained) will materially increase the output of a crane.

Make it a point to examine this revolutionary control at the Iron and Steel Exposition. If you can't attend this show arrange to operate this control at the EC&M factory, Cleveland, Ohio, where it will be set up a few days after the show closes.

THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

NEWS ABOUT PEOPLE

Finlay Assumes New Duties With J. G. White

Walter S. Finlay, Jr., who recently resigned as vice-president and director of the American Water Works & Electric Co. and as president of the West Penn Electric Co., to join the J. G. White Engineering Corp. as vice-president, was many years ago a member of the J. G. White Engineering staff for a short time.

During his 20 years association with American Water Works Mr. Finlay directed the engineering plan and policies of its power subsidiaries during the period of their rapid expansion and his services have been retained by them to advise on engineering matters. Prior to his association with American Water Works he was in charge of all engineering and operation of the power

Underwood & Underwood

division of the Interborough Rapid Transit Co. of New York.

In announcing the appointment, Gano Dunn, president of J. G. White Engineering Corp., stated that Mr. Finlay's association with the executive group of the corporation is a part of the corporation's program to provide for increasing business in the utility and power field, in a way that will enable it to cope with the increasing power business that is expected in the immediate future.

•

▶ C. J. GRIFFITH celebrated on September 1 the fiftieth anniversary of his Arkansas citizenship. He retired in 1935 as vice-president of the Arkansas Power & Light Co.

▶ ORMOND TITUS, executive vice-president of the New York State Electric & Gas Corp. for the Binghamton area, has been elected a director of the Marine Midland Trust Co. of Binghamton.

▶ A. E. NEWMAN, manager of wiring material sales for the General Electric Co., was recently appointed to membership in Underwriters' Laboratories' industry advisory conference for rubber-covered wires and cable. Mr. Newman succeeds W. E. Sprackling of the Anaconda Wire & Cable Co., who has served on the rubber-covered wires and cables advisory conference for many years.

▶ GEORGE C. WHITNEY has been named advertising manager for the Norge division of Borg-Warner Corp. Mr. Whitney, who has been assistant advertising manager of the division for six years, succeeds JAMES A. STERLING, who has been named general merchandise manager for all Norge products. Mr. Sterling has directed Norge advertising and sales promotion for nine years.

▶ P. M. BRATTEN has been appointed as head of all activities in the household sales division of the Frigidaire division of General Motors Sales Corp. Prior to this appointment Mr. Bratten had been for several years manager of the company's Fort Worth sales district with headquarters at Fort Worth, Tex. Before his transfer to the Fort Worth district he had been connected with the sales department of factory headquarters in Dayton, Ohio.

Ben W. Creim Receives Bonneville Assignment

Ben W. Creim has been appointed principal engineer in charge of the project construction section of the engineering division of the Bonneville project. Mr. Creim will work under the supervision of Charles E. Carey,

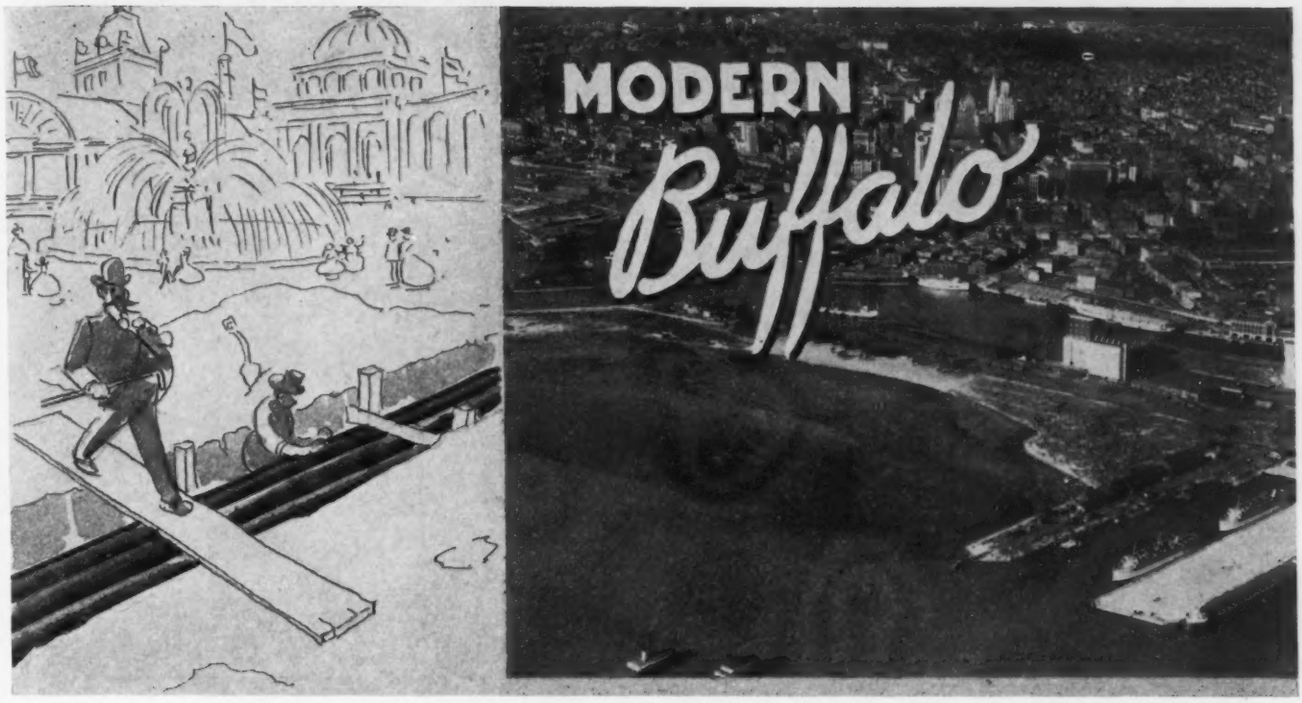
who is head of the engineering division. For the past three years he was principal engineer for the Rural Electrification Administration in charge of design and construction of all REA's rural systems in the western states.

From 1919 to 1927 Mr. Creim was electrical engineer with the Los Angeles municipal power system, in complete charge of all substation and power house testing. During that time he was also instructor in electrical engineering at the University of California. Before becoming regional engineer of REA, Mr. Creim was consulting engineer of Tulare City, Calif., and chief electrical engineer of the Modesto Irrigation District.

•

▶ J. R. GUILD, formerly connected with the Albuquerque Gas & Electric Co., Albuquerque, N. M., has been made

ORANGEBURG HAS *long* BEEN PART OF



© *Fairchild Aerial Surveys, Inc.*

Buffalo, N. Y., site of the 1901 Pan-American Exposition, favored by its nearness to one of the world's greatest hydro-electric generating plants, at Niagara Falls, early took the lead in a low-cost distribution program.

Orangeburg's economies are both immediate and ultimate, providing permanently low cost electric current distribution. By practically eliminating maintenance costs, replacements, difficulties in locating faults and outages, caused by conduit failure. Orangeburg helps you to save expenditures otherwise useless.

Just another of the

"Orangeburg Points That Count"

The Orangeburg trademark is a guarantee of the best of Fibre Conduits, a time-tested, enduring "service" of cable protection wherever electrical raceway facilities are to be installed underground.

● Original installations of Orangeburg Fibre Conduit made in Pan American years are today giving trouble-free service, with additional decades of service still ahead. Orangeburg is proud of the part it helped Buffalo to play in the early development of low cost power distribution — a service which it has since rendered to other cities, large and small, throughout the world.

Precision engineering, superior protective qualities, greater strength, lightweight and economy are among the factors that have contributed to Orangeburg's preeminent position in the industry.

For installation underground with CONCRETE ENCASEMENT: ORANGEBURG *STANDARD* FIBRE conduit is recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

For installation WITHOUT CONCRETE ENCASEMENT: the ORANGEBURG dual-economy NOCRETE conduit is recommended for service entrances, extensions, parkways, and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP.

GRAYBAR ELECTRIC COMPANY INC.

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE. NEW YORK CITY

ORANGEBURG ***Standard*** **for installation** ***with*** **concrete encasement**
NOCRETE for installation ***without*** **concrete encasement**

LOWER
POWER LINE
CONSTRUCTION AND
MAINTENANCE COSTS
with SPEED—SAFETY
AND ECONOMY

•

DIGS THE
HOLE

SETS THE
POLE
AT ANY
ANGLE
IN ANY KIND OF
GROUND • • •

HIGHWAY
Earth Boring
MACHINES

You can cut time—lighten labor—and add safety to the building of your power lines with Highway Earth Boring Machines. They bore at difficult angles and in hard to reach places. They replace, reset, and move pole lines in less than half the time and usual cost. They have great capacity, flexibility, power, and strength to operate with the largest truck and tractor motors. This lightweight rugged tool gives utilities a chance to make greater savings in the cost of setting poles. Send for our catalog.

OTHER HIGHWAY TIME- AND COST-SAVING CONSTRUCTION AND MAINTENANCE EQUIPMENT—

HIGHWAY BODIES
HIGHWAY POLE AND CABLE REEL TRAILERS
HIGHWAY DERRICKS
HIGHWAY "CABLE SPLICER" TRAILERS
HIGHWAY WINCHES
HIGHWAY ACCESSORIES

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

assistant treasurer and secretary of the New Mexico Power Co. at Santa Fe. He has been connected with the Albuquerque company for sixteen years.

▶ P. R. ROEHM, formerly assistant engineer with New Orleans Public Service, Inc., has become associated with Ebasco Services, Inc., New York.

OBITUARY

▶ L. H. ROSE, supervisor of electrical design for Seattle's city lighting department, died at his home in that city, following a heart attack, on September 6. He was 58 years of age. Mr. Rose was born in Kinsman, Ohio, and went to Seattle in 1905, following graduation from the Bliss Electric School in Washington, D. C. He had since that time been employed by Seattle City Light.

▶ FREDERICK M. SERVOS, chief electrical engineer, Rio de Janeiro Tramway, Light & Power Co., Ltd., Rio de Janeiro, Brazil, died July 8 in Brooklyn, N. Y. In 1922 he was employed by the Canadian & General Finance Co., Ltd., Toronto, subsidiary and consulting and purchasing agent for the Brazilian Traction, Light & Power Co., Ltd. In 1923 he became electrical engineer in charge of electrical work in the Toronto office and the following year was transferred to the parent organization in Rio de Janeiro as chief electrical engineer for a group of companies controlled by Brazilian Traction Light & Power Co. Mr. Servos was returning to Ontario for reasons of health at the time of his death. He was local honorary secretary of the American Institute of Electrical engineers for Brazil from 1927 until his departure from Brazil this year. Mr. Servos was 45 years of age.

▶ JOHN P. GARVIN, resident engineer, New York State Electric & Gas Co., Elmira, died May 12, in his forty-ninth year. A graduate of Montana State College, he served successively from 1919 to 1926 as engineer for the Montana State Highway Department, operator at Holter plant of Montana Power Co. and at the Tumwater plant of the Great Northern Railway; junior electrical engineer, U. S. Bureau of Mines, Pittsburgh, and switchboard engineer Westinghouse Electric & Manufacturing Co. In 1926 he became central station layout engineer for W. S. Barstow & Co., Reading, Pa. Later he was electrical engineer for the Metropolitan Edison Co. and resident engineer for the E. M. Gilbert Engineering Corp., both at Reading, before assuming the position with New York State Electric & Gas.

Night and Day

. . . whatever flood, storm or hurricane emergency may arise . . . your T & B Distributor is ready to help you meet it! He has the stocks on hand . . . ready for immediate use . . . ready to help you restore service without delay. Here's a case "from the record".

Flood waters had risen 20 feet above the streets of one of our largest industrial cities. When the river subsided, among other things, the possible presence of gas made it dangerous to use blow torches in repairing power lines and in restoring service to buildings. And of course time was at a premium.

The local T & B Distributor was called. Yes—he had T & B solderless connectors . . . *on hand* . . . enough to let linemen go to work immediately. A radiogram brought additional thousands by plane. Result: Service was restored . . . promptly . . . efficiently. No irksome delay because of lack of supplies! No fussing and fuming trying to locate them! The local light and power company knew exactly where to go . . . for *ready supplies*, for *immediate service*, . . . to the local T & B Distributor!

But your T & B Distributor is more than a stand-by service. His warehouse is full of electrical supplies to meet all your normal requirements, too. Thousands of products of hundreds of manufacturers are "under his roof" . . . so that you can get *what* you want, *when* you want it, at far less cost per item than if you should attempt to stock them individually. Make your T & B Distributor's warehouse your warehouse. Take advantage of the service he is ready to give you . . . night and day!

#4

A series of advertisements designed under the T&B Plan to set forth the economic reasons for the fixed T&B Distributor policy.

The T&B DISTRIBUTOR SERVES and SAVES

The T&B distributor saves you money

HE REDUCES THE "HIDDEN COSTS" BECAUSE:

He eliminates depreciation and obsolescence
He eliminates stock investments
He eliminates insurance and taxes
He saves on freight and cartage

HE SAVES YOU ADDITIONAL DOLLARS BECAUSE:

There are fewer orders to write
Fewer shipments to handle
Fewer invoices to check
His Catalog and price information is up to date.

THE THOMAS & BETTS CO., Inc.

MAIN OFFICE and FACTORY — ELIZABETH, N. J., U. S. A.

SALES OFFICES

Los Angeles, California • San Francisco, California • Denver, Colorado • Atlanta, Georgia • Chicago, Illinois • New Orleans, Louisiana • Boston, Massachusetts • Detroit, Michigan • Kansas City, Missouri • St. Louis, Missouri • Elizabeth, New Jersey • New York City, New York • Syracuse, New York • Cleveland, Ohio • Cincinnati, Ohio • Philadelphia, Pennsylvania • Seattle, Washington • Dallas, Texas • Montreal, Quebec • Toronto, Ontario • Winnipeg, Manitoba • Vancouver, B. C.

EXPORT DEPARTMENT — BROOKLYN, NEW YORK

ELECTRICAL FITTINGS SPECIALISTS SINCE 1899

MANUFACTURING - MARKETS

Increased Business Seen for Industry

An active period of industrial plant expansion is indicated in reports and communications reaching Washington. Many manufacturers are planning to use two shifts when orders justify it.

Most of the expansion will be in the form of new buildings specially designed for specific purposes, rather than making use of old factory buildings. It is indicated that some of the expansion is to take care of anticipated price increases by providing greater efficiency in production.

Specialists in Washington are confident that one effect of the war will be to stimulate most lines of American business. They believe American demand for machine tools will increase steadily. Foreign orders are likely to decrease slightly. England and France will be more interested in buying finished products. Increased business with Canada is expected. More business for American industry is anticipated in Latin America.

Electrical manufacturers report an increase in orders during the past two weeks, most of it being inventory purchases. Finished product prices have been relatively stable, but indications were that some increase would be necessary in the future to take care of the recent rise in commodity prices.

Electrical utilities report some buying with more slated in the future. It is anticipated that plans calling for new generating equipment and other plant expansion is not likely to be greatly hindered by the European conflict. In some instances the prospects of higher power demands has caused the companies to speed plans for new capacity.

•

Pledge Price Maintenance

A pledge to maintain its present prices as far as possible and to resist any inflationary moves through "unjustified price increases" has been given by the Lincoln Electric Co., through James F. Lincoln, president. Mr. Lincoln said that if prices of materials and labor costs go higher, only that increase will be reflected in Lincoln products.

•

Westinghouse Employees to Get 6 per Cent Bonus

Adjusted compensation of 6 per cent will be paid to all employees of Westinghouse Electric & Manufacturing Co. for September, in accordance with the wage and salary plan.

This compares with bonus paid in August of 8 per cent, 10 per cent in July, 7 per cent in June, 5 per cent in May, 3 per cent in April, 2 per cent in March and 1 per cent in February.

The amount of adjusted compensation is established each month in proportion to the net earnings of the preceding three months. The indicated net earnings for August were $853,045, as compared with $773,841 in July and $1,573,605 in June, a total of $3,022,491 for the three months. This compares with net earnings of $3,331,218 in the three months ended May 31, 1939.

•

Electric Export Market

"Million Dollar Electrical Export Markets" is the title of a new series of monographs commenced with the August 15 issue of "Electrical and Radio World Trade News" by the Electrical Division of the Bureau of Foreign and Domestic Commerce. The first relates to Great Britain. More than a score of countries, to which the United States has sold in excess of one million dollars worth of electrical equipment during one of the years 1936, 1937 and 1938, are to be reviewed.

The publication is issued three times a month, at an annual subscription price of $1.

Electrical Equipment Exports Due for Rise

Increased exports of electrical equipment from the United States are anticipated by all manufacturers as a result of the war, according to John H. Payne, chief of the electrical division of the Bureau of Foreign and Domestic Commerce. Opinion is uniform, Mr. Payne said, that the preoccupation of European countries in manufacturing munitions will prevent them from offering serious competition to U. S. electrical exporters in practically all non-European countries.

"I expect the electrical equipment export business to follow the general lines of other businesses and enjoy a substantial boom, particularly in Latin America," Mr. Payne said. "Perhaps we may even find an expanded market in Europe as its electrical factories are diverted into production of military supplies and munitions.

Effect of War

Mr. Payne said that the effect of the war on this business is just beginning to be felt and each day brings a change in the situation as various nations adjust their import restrictions and regulations to meet new conditions. The Argentine modified import restrictions on 62 commodities last week, one of which was copper wire and cable. This commodity is to be admitted in unlimited amounts. Restrictions on other electrical equipment are expected to be relaxed.

Latin America offers increased opportunities for electrical equipment sales now that the German competition is restricted. Germany stood second to the United States in "materials for electricity" in the Argentine market in 1937. Germany led all other countries, including the United States, in supplying Argentina with such equipment as electric irons, cookers, percolators, toasters and heaters; storage batteries (other than dry cell), electric service

KEEP IN CONSTANT COMMUNICATION WITH YOUR REPAIR CREWS... BY MEANS OF

RCA Emergency Radio Equipment

RCA offers its unique radio experience to assist utility companies planning to use the radio frequencies assigned for communication between truck and headquarters.

As this new field of communications opens up for you, RCA places at your disposal its unmatched experience gained in pioneering in every field of radio. RCA operates a world-wide radio communication system as well as the two major networks of NBC. RCA builds the essential instruments for radio transmission and reception of telegraphy and sound, and conducts constant research in RCA Laboratories to increase and improve the applications of radio.

It is this background of experience that RCA now offers to place at your service. As a ready reference on emergency communication RCA has prepared a brief booklet giving all the essential information that you need to plan a system. This booklet is called "Emergency Communication by Radio" and we will gladly send you a copy without obligation if you will fill in the coupon below.

Emergency Communications Section, (EW-9)
RCA Manufacturing Co., Inc.,
Camden, N. J.

Kindly send me your informative booklet —"Emergency Communication by Radio."

Name.....

Street.....

Address.....

RCA **EMERGENCY RADIO EQUIPMENT**

RCA Manufacturing Company, Inc., Camden, N. J.

A Service of the Radio Corporation of America

"MEGGER"
TRADE MARK REGISTERED U S. PAT OFF

"Know by TEST" — says E. T. L.

MORE THAN 20 YEARS AGO the Electrical Testing Laboratories of New York purchased their first "Megger" instrument as a rapid and practical means for testing insulation resistance of electrical equipment. This same instrument *is in use today*, and additional sets have been added to meet current demands . . . witnessing to the importance of the "Megger" Insulation Resistance Test as a means of detecting and preventing trouble, and to the outstanding ruggedness and reliability of "Megger" instruments.

The "MEGGER" Insulation Tester

Is a high-range direct-indicating Ohmmeter mounted in the same case with a hand-driven d-c generator which supplies test current at 500, 1000, 2500 or even 5000 volts according to the rating selected. The instrument can be used anywhere, at any time, and by any intelligent person. Motor-driven types for continuous operation are also available. Your copy of our descriptive "Megger" Catalog 1550-W, will be sent promptly upon request.

JAMES G. BIDDLE CO.

ELECTRICAL AND SCIENTIFIC INSTRUMENTS, 1211 ARCH ST., PHILADELPHIA, PA.

meters, ammeters and voltmeters (other than pocket type). In these lines the United States may expect to fall heir to much of the trade abandoned by the Nazis, according to foreign trade experts.

What applies to the Argentine also applies to Brazil, where Germany has made alarming inroads in the field of electrical equipment in competition with American exporters. Brazil is a price market and often American electrical products have been placed at a disadvantage in competition with cheaper foreign, particularly German, products. German exports were often supported by premiums to make for lower prices. The system of barter also aided German competition. The war has changed this situation.

It is contended that Cuba, Mexico and Chile offer good markets for American exports now that German competition has been restricted by the war. Sources in Washington confirm that inquiries from Latin America have doubled since the crisis. Exporters report heavy orders from Latin American and South American buyers, who are becoming increasingly alarmed over the disruption of manufacturing activity in Europe.

•

Manufacturers Vote Dividends on Common

Several electrical manufacturing companies have recently voted dividends on their common stock.

Reliance Electric & Engineering Co. has declared a dividend of 25 cents per share on the common shares, which was payable September 25, to stockholders of record September 20. This compares with dividends of 12½ cents per share previously distributed each three months.

A dividend of 20 cents a share on the common stock was voted by the Driver Harris Co., increasing the dividend from 15 cents paid on July 10 and 10 cents on April 10, this year.

Directors of Electric Controller & Manufacturing Co. voted a dividend of 50 cents, payable October 2 to stock of record September 20. This makes $1.50 voted so far this year. Total dividends paid in 1938 were $3.25.

Directors of Kelvinator of Canada, Ltd., have voted an interim dividend of 50 cents a share. This is the first dividend on the common stock since 75 cents was paid on September 29, 1938.

New York Metal Prices

	Sept. 19, '39 Cents per Pound	Sept. 13, '39 Cents per Pound
Copper, electrolytic	12.00*	12.00*
Lead, Am. S. & R. price	5.50	5.50
Antimony	13.00	12.25
Nickel Ingot	35.00	35.00
Zinc, Spot	6.64	6.64
Tin, Straits	70.00	73.50
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Worth Less Than Nothing

THE JOB of every purchasing agent is primarily to buy the cheapest thing that will serve the purpose. Good enough is as good as perfect and the extra cost of unnecessary quality is wasted money. It is the responsibility of the engineering department to specify the materials or parts required so that the purchasing agent might be able to pass judgment on the materials offered by the competing vendors. Unfortunately, it is often impossible, or at least impractical, to write into the specifications all of the properties required of the parts or materials to be purchased.

When only one or a few vendors have the necessary quality of material to offer, the engineering department specifies in the bill of material the name or names of makes or manufacturers. Purchasing agents usually don't like this. It hampers them and they often feel that the restrictions imposed are needless. If under such conditions the prices quoted are "out of line" the purchasing agent will ask the engineering department to approve bids from other manufacturers. This is good business if the engineering department does not become over zealous in its desire to cooperate with the purchasing department.

Minor design details play an important part, but because they are minor, they are often neglected. An engineer had specified a certain make of adhesive for fastening felt pads. The purchasing agent found he could get a competing make for less than half the price. The saving of about 50 cents a pound was a strong argument and the engineering department approved the lower price adhesive, a sample of which showed high adhesive strength. The fact that less than a quarter of a cents worth was used on a unit was ignored.

Customers did not complain and it was not until salesmen in the field reported that the pads were falling off, apparently because of the action of oil on the adhesive, that the company found out that the saving of a fraction of a cent on their thousand dollar product was costing them customer good-will.

It would be stupid to ignore the availability of lower cost materials. But it is more stupid to accept them without first subjecting them to rigid tests both in the laboratory and in service. If the possible net savings could not cover the costs of making such tests, no attempt should be made to substitute for the higher cost material of known quality.

This same procedure should be followed in the selection of material used for the first time in which case greatest dependence must be placed on laboratory tests. Reliable manufacturers publish dependable test data for many of the properties of their materials. For tests for special requirements, the engineering department, even in the smaller plants, should have available simple testing equipment. For determinations requiring more expensive and elaborate equipment, the services of commercial testing laboratories should be obtained.

All of the material that goes into a product is put in it to perform a definite service. Therefore, it is service that is being purchased, and if the material purchased is not capable of rendering the service required, it has a negative value. It is worth less than nothing because it does damage instead of rendering service.

Editorial from PRODUCT ENGINEERING

*for example

ELECTRICAL
TESTING
LABORATORIES

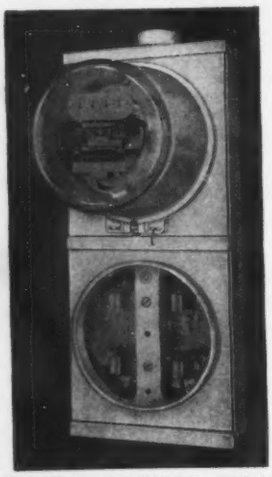
East End Avenue at 79th Street
New York, N. Y.

Something

that makes products "click" —is simply the adequate functioning of all parts... and that can be determined BEFORE the product goes to market.*

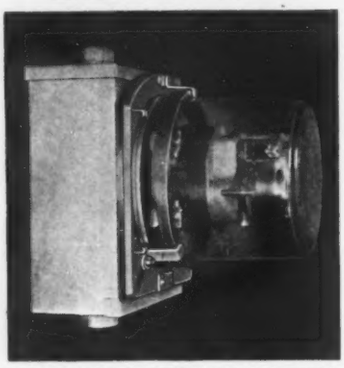
ANCHOR

SOCKET METER EQUIPMENT



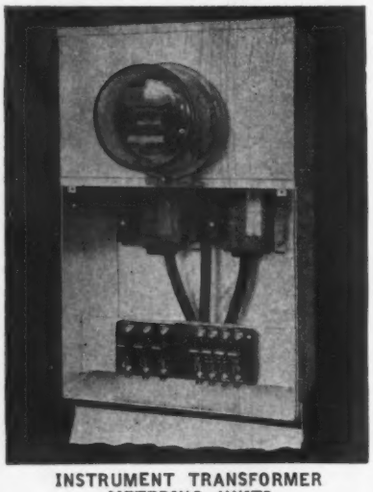
SIMPLIFIED STANDARD TROUGHS

With or Without Disconnects. Outdoor or Indoor. Vertical or Horizontal.



NEW PORTABLE BY-PASS APPARATUS

Eliminates Interruption of Customers' Service During Testing or Replacement.



INSTRUMENT TRANSFORMER METERING UNITS

For Standardized or Through Type Current Transformers.

Bulletins on Request

ANCHOR MFG. CO.

40 Oliver St., Boston, Mass.

FACTORY • MANCHESTER, N. H.

Field Reports on Business

Increased activity in the electrical industry is seen as a result of the war in Europe and the pick-up in domestic recovery. Manufacturers report utility and industrial buying. Additional generating capacity is being planned by the utilities in new construction budgets.

NEW YORK

An active period of industrial plant expansion is indicated in reports and communications reaching Washington. Many manufacturers are planning to use two shifts when orders justify it. European war activities are expected to stimulate American business.

Domestic business has felt increased activity during the past two weeks, most of it being inventory purchases which were driven in by the prospects of higher prices. The largest portion of forward buying is yet to come into the market. Reports indicate that there is lots of business around, most of it yet to make appearance in the form of signed orders.

While the electric utility industry considers itself in good shape to meet an increase in power demands, many companies are rushing plans for new capacity and other equipment in expansion programs. Some utility inventory buying has been in evidence and more is yet to come.

An indication of the inventory position of industry is seen in the fact that it is at the lowest point in 6½ years.

With steel operations at 74 per cent, against 46 per cent last year, a further rise is expected. Reaffirmation of current steel product prices for the fourth quarter has started a rush of buying, which is not considered a war boom, since it is for domestic use. Electrical manufacturers stated that further activity in the steel industry will mean additional electrical equipment orders. Reports indicate that there is some industrial buying, with more slated once the fall pick-up gets under way.

PACIFIC COAST

August building permits recorded a combined increase of 15 per cent for the seven Western states over August, 1938, and 25 per cent over August, 1937. This is considered a sharper than usual seasonal rise, being 15 per cent over July. Shipbuilding continues its surprising growth, though the four cargo vessels assigned to Los Angeles will be supplied with their electrical equipment direct from Eastern factories. However, Seattle yards are in the market for $125,000 deck and auxiliary deck equipment and a San Francisco subsidiary of Bethlehem has just been awarded five type C-1 cargo carriers at $2,172,000 each. A leader in the fight to restore a rightful proportion of shipbuilding to coast yards has been Vice-President R. E. Fisher of the Pacific Gas & Electric Co.

Central station equipment leads in recent buying, the outstanding orders covering awards of $663,712 to Allis-Chalmers for circuit breakers and parts and of $371,000 to Railway & Industrial Engineering Co. for 23,000-volt bus structure additions and changes, all for Boulder plant. Low bid for the Friant Dam unit of California central valley project was $8.715.358. Other apparatus orders covered 30.000 G.E. watt-meter assemblies at 36 cents each, twelve months contracts for smaller disconnect switches, motors and bus parts, and $114,000 circuit breaker parts, all for Los Angeles; $21,179 aluminum wire, $3,495 insulators, and $3,993 transformers, all New Mexico; power house awards of $99,500 to General Electric for transformers, switchgear and Petersen coil, and $31,364 to Allen Company for circuit breakers.

NEW ENGLAND

Announcement this week by Frank D. Comerford, chairman of the New England Power Association, of the resumption of plans formulated in 1937 for the expansion of the Manchester Street station of the Narragansett Electric Co., Providence, R. I. involving more than $4,000,000, is of major interest. As formerly outlined, this project calls for the installation of a 40,000-kw. G.E. turbo-generator, a single 430,000-lb. capacity steam boiler, which will be supplied by the Combustion Engineering Co., and, in addition, a large amount of electrical regulation equipment.

Utilities throughout this district are entering the market in a very active way. Last week a $40,000 order consisting of condenser equipment and accessories was placed with one utility; inquiries for in the neighborhood of 10,000 watt-hour meters are noted and rush demands for transformers, switching apparatus and control are reported in good volume. The navy has awarded a contract for switching apparatus at $130,459 to the Westinghouse Electric & Manufacturing Co.; bids are in for a 1,500-kw. rotary converter for the Portsmouth, N. H., navy yard and industrial plants are showing an encouraging trend in buying small switches and control apparatus. Small motor buying is advancing.

The Fore River plant, Bethlehem Steel Corp., has 7,200 employees on its rolls and is pursuing the greatest building program in its history.

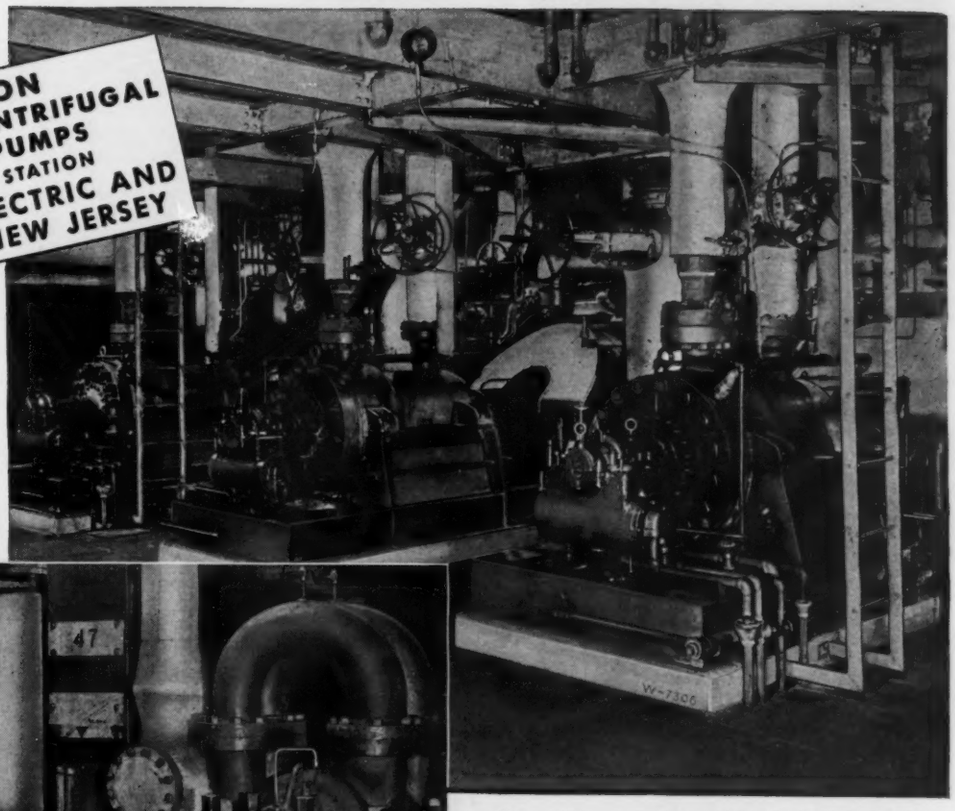
CHICAGO

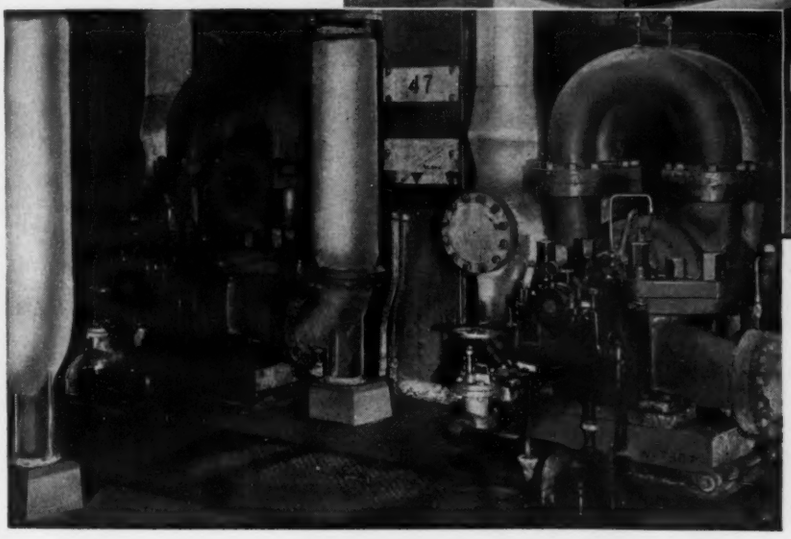
The rush of buying of raw materials and industrial equipment covering numerous lines continued at a rapid pace during the past week. The most spectacular gains were made in the steel industry, where the demands from nearly all industrial activity assumed almost fantastic proportions. The plants in this area are rapidly opening additional furnaces and calling back men who have been unemployed for as long as several years. Production at the Inland Steel Company plant jumped to 90 per cent of capacity.

Demand for electrical equipment increased sharply since the first of the month. Manufacturers of wire and cable are working overtime to take care of the flood of inquiries. Orders for motors and control apparatus have picked up sharply. Radio set sales are expanding steadily, while radio equipment manufacturers are benefiting materially from War Department contracts.

Illinois Bell Telephone Co. is installing new equipment in three Chicago offices. A large packing house has placed sizable orders for switchgear and other apparatus while changing power from 2,300 to 4,000 volts. Electrical power output increased last week to 13 per cent above a year ago. Retail trade continued to advance, with the large mail order houses establishing a new high record for sales.

WORTHINGTON
HIGH PRESSURE CENTRIFUGAL
BOILER FEED PUMPS
ESSEX GENERATING STATION
PUBLIC SERVICE ELECTRIC AND GAS COMPANY, NEW JERSEY





Above—Three 6" 6-stage Worthington Boiler Feed Pumps, steam-turbine-driven, capacity of 650,000 lb. per hr. each . . . 200 p.s.i. suction pressure and 1765 p.s.i. discharge pressure, 220° F., 3570 r.p.m.

Left—Two of three 6" Worthington Boiler Feed Pumps, motor-driven, capacity of 650,000 lb. per hr. each . . . 200 p.s.i. discharge pressure, 220° F., 1750 r.p.m.

A steadily growing list of important users gives evidence of sustained confidence in Worthington high pressure centrifugal pumping units.

In every case the high initial efficiency of these units is being steadily maintained because Worthington has always built to the principle that the only real economy can be obtained by producing equipment that will continue to give high operating efficiencies and assure uninterrupted performance through successive years of service.

The complete Worthington line of Centrifugal Boiler Feed Pumps covers without compromise every condition, from the smallest capacities and medium pressures. to the largest high pressure units ever built.

MEMBER HYDRAULIC INSTITUTE

200 lb. per sq. in. to 3000 lb. per sq. in.

CP9-1

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WORTHINGTON
AIR CONDITIONING EQUIPMENT
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DEEP WELL, SUMP, AND DRAINAGE PUMPS
STEAM CONDENSERS AND AUXILIARIES
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For street . . trench . . conduit service
V-BELT DRIVES LIQUID METERS

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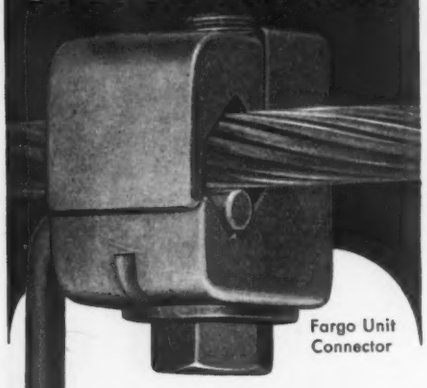
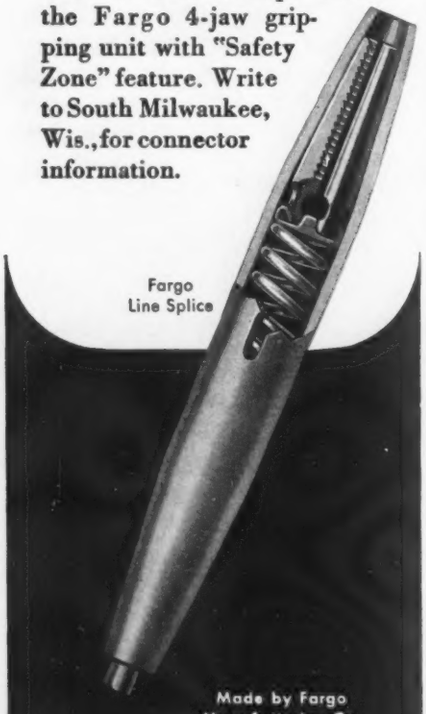
Connect With
FARGO
When You TAP or
SPLICE the line



Fargo Unit Connector

● RE-USE the same FARGO UNIT CONNECTOR year after year . . . it still "grips like a vise". One-piece construction . . . nothing to lose...saves time and trouble.

● SPLICE your line with the FARGO LINE SPLICE and it *stays* spliced. Even burred end wires can't slip inside the Fargo 4-jaw gripping unit with "Safety Zone" feature. Write to South Milwaukee, Wis., for connector information.



Fargo Line Splice

Made by Fargo Manufacturing Co.

DISTRIBUTED BY
LINE MATERIAL CO.

LETTERS TO THE EDITOR

Steam Turbine Oil

To the Editor of ELECTRICAL WORLD:

The writer would like to congratulate Mr. Farmer for his very interesting observations on the stability of steam turbine oils, as appeared in your May 20, 1939, issue, and at the same time supplement his remarks by referring to the test method and some personal observations in the use of oils in different turbines. A reliable accelerated test for identifying good turbine oils is certainly worth developing, and Mr. Farmer has made a very worthwhile contribution in this direction. Any test which approaches the worst conditions experienced in turbines should be worthy of study, and in this connection the presence of water, air, agitation, heat and catalysts should not be omitted. However, it is found that when it comes to adding water in glass reaction chambers, there is a strong tendency for some of the glass (including alkali) to dissolve. Also, one must guard against the growth of organic bodies in the water, with resulting fictitious data for sludge, acid, etc.

The writer would like to warn the uninitiated against making too quick a decision about the ultimate life of any oil not obviously poor at the start. The best criterion for any good oil is its ability to stand up for long service hours in a variety of steam turbines under various adverse conditions without showing appreciable increase in acidity or viscosity, tendency to hold water and tendency to form objectionable amounts of sludge. The question of good wetting of surfaces and absence of corrosion on certain submerged surfaces may also be considered, but this difficulty has not been experienced except for corrosion of stationary parts in the presence of considerable moisture or a tendency for new oil to have a rather high surface tension with resulting poor separation of small amounts of water held in the oil as a cloud.

It has been found that a turbine which takes in large amounts of water from various seal glands and drains usually produces a lot of rust which circulates through the system, and this in turn helps to break down the oil and cause wear on bearing surfaces. This is usually attended by rapid development of sludge (even in the best oils) and an acidity rise may be expected, especially in the oils having long service. It is possible that certain iron soaps may be formed and a small amount of water-soluble acid may be removed during the period when heavy water inleakage starts, but the oil will generally become progressively worse in all respects unless the above condition is corrected quickly. Unfortunately, this need for minimum moisture and absence of active metal oxidation catalysts has not been fully appreciated by turbine manufacturers and operators in general and the best turbine oils may be blamed for conditions under which they cannot possibly give good service. Thus, the chemist or chemical engineer is likely to gain the impression that the design of turbine oil systems is a subject that has been very much neglected.

Another point that must be considered is the life expectancy of an oil and the kind of service it will give during its life. For example, an oil having the highest stability characteristics by all the accepted tests and showing remarkably low acidity, tendency to form sludge, etc., for a period of time, should eventually reach an end or breaking point. Under normal conditions this may occur at any time after, say, 15,000 or more hours of service. One such oil was found to show very rapid decomposition, and this could not be halted even after adding 50 per cent of new oil. The conclusion was that if this oil was inhibited, as well as "solvent refined," the inhibitor could not be very effective under these conditions. Sufficient experience with the most recently developed oils is lacking, but in any case it is strongly recommended that any laboratory tests be continued to the breaking point, in order to note the slope of the breakdown-hour curve. This may have a very practical significance, especially if it may not be convenient to stop the turbine for cleaning and changing oil. Lack of cleaning may shorten the breakdown point by many thousand hours.

As a final thought, one should not be surprised if an oil should suddenly break down in one turbine after a relatively short run and give excellent results over a long period in another. Therefore, the more operating data that can be obtained on specific oils under various conditions of operation in the same and different turbines, the better one may be qualified to say how effective the natural or added oxidation inhibitors may be or which refining processes for certain crudes are more generally desirable. As a purely personal opinion, the inhibitor idea seems to offer one of the longest forward steps in the development of good lubricating oils and its more exact application may be anticipated.

J. K. RUMMEL,
Chemical Engineer,
Shanghai Power Company,
Shanghai, China.

Making a Science of Service . . . Chase research in the condenser field is concerned first of all with investigating your condenser tube needs and determining, scientifically, the alloy that will meet them most economically. Chase engineers will be glad to help you without obligation. Just write.

CHASE CONDENSER TUBES

CHASE BRASS & COPPER CO., *Incorporated,* WATERBURY, CONN.

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

PAGE FENCE

HOW HIGH IS A 7-FOOT FENCE?

Of course a 7-foot fence is 7 feet high, but the point is that PAGE service will help you select the proper fence whether it be 4 or 14 feet high. PAGE—America's first wire fence since 1883—alone offers you a choice of five quality fence metals to fit all atmospheric conditions and an exclusive wing-channel post designed for greater utility. One of our 92 Association Members is nearby to render skilled, courteous service. Secure his name and free literature—write PAGE FENCE ASSOCIATION, Bridgeport, Conn.

No Worry

About the LINE SPLICES When You Do the Jobs with NATIONAL NICOPRESS Sleeves and Tools

For Power distribution splices, NICOPRESS makes the grade 100 per cent every time. With these highly efficient compression tools and sleeves the job of making the splices is quickly and easily done. Every completed splice has maximum strength equalling or surpassing the rated breaking strength of the wire.

All Nicopress splices are tight as a weld and conductors will not pull out. Neither air nor moisture can seep into a completed splice, so corrosion is minimized and the conductivity of the wire maintained.

Tools are light, convenient to carry and easy to handle and operate.

Tools and sleeves are available for practically all types and sizes of wire used for Power distribution lines. Prices and samples are yours for the asking—no obligation. Write today.

THE NATIONAL TELEPHONE SUPPLY COMPANY

5100 SUPERIOR AVE
CLEVELAND, OHIO

Export Distributor—The International Standard Elec. Corp., New York, N.Y.

War History

[*Continued from page 58*]

cent interest selling at four to eight points below par.

In the second half of 1916 the sky brightened. An editorial in the October 21 issue, headed "A Sellers' Market for Bonds" concludes with these words: "Whatever the near future may develop, central station companies generally have financed their immediate capital requirements upon very satisfactory terms and will enter the approaching busy season without the handicap of burdensome early maturities of debts bearing high interest rates." The year 1916 was a happy year for electric utility financiers.

But not 1917. Shortly following the entrance of the United States into the war came the first Liberty Loan. In reference to the effect of the loan on central station financing ELECTRICAL WORLD says, June 2, 1917, that the utilities face now "a demand for more and more energy for absolutely imperative industries at a critical juncture when it is conceded that corporate financing must and should wait until the national treasury says that it has enough."

Other governmental loan drives followed during the war period. In the intervals between these drives the electric utilities were at a great financing disadvantage. Industrial securities promising, and paying, large returns, had the center of the financial stage. But with costs piling up on them and being a regulated industry with no hope of large profits to lure the security buyer. the electric utilities had a hard time finding enough money for their most desperately essential needs.

Eventually government intervention became necessary. One finds in the issues of the second half of 1918 frequent comments on the need for money and that government is the only immediate source. A typical news story in the August 3 issue tells of reimbursement by the United States War Finance Corporation to the New Orleans Railway & Light Company of $1,000,000 to cover expenditures made necessary by the war. The utilities were not alone in seeking this relief; many other industries did it too.

The war story ends with 1918. In the aftermath period the electrical industry had its troubles and its triumphs, but that is another story.

Rugged Insulation that
Defies Heat-Distortion
in 1000-kw Rotary Converters

DAY AFTER DAY, the 1000-kw rotary converters in a large eastern railway powerhouse spin constantly at 900 r.p.m., supplying power for trains and trolley coaches. Temperatures in the armature may rise and fall as much as 60°C., yet insulating wedge-bars must remain always firmly-embedded in coil slots . . . unaffected by expansion, contraction or other heat distortion.

That is why the engineers of this electric company have adopted Bakelite Laminated (Micarta) as the standard for converter wedge-bars. This rugged dielectric possesses an expansion coefficient of only .00002 per degree Centigrade, and safely withstands temperatures up to 110°C. And its high mechanical strength and toughness continually withstand the centrifugal load of rotating slot-coils.

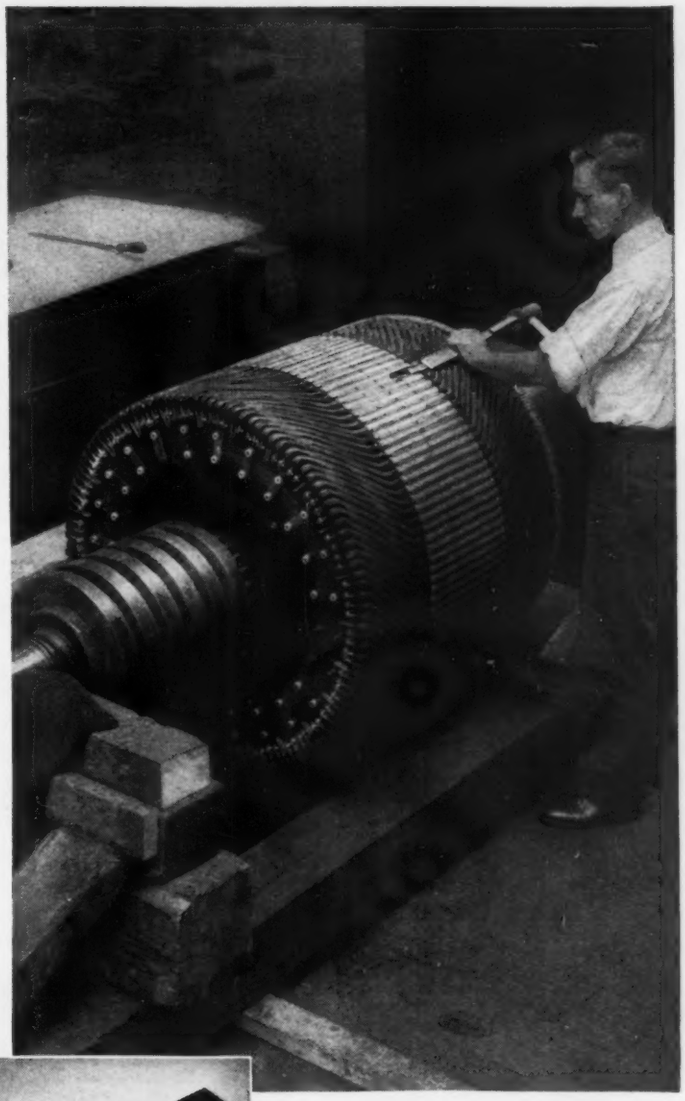
Here is but one example of the countless ways in which Bakelite Laminated and other Bakelite plastic materials may help you to improve the insulation and operation of your electrical devices. Write for comprehensive Portfolio 3 of illustrated booklets that offer detailed information on the wide variety of Bakelite dielectric materials now available.

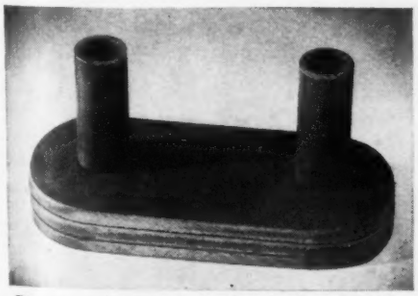
BAKELITE CORPORATION, 247 Park Ave., New York
Chicago: 43 East Ohio Street
BAKELITE CORPORATION OF CANADA, LTD., 163 Dufferin St., Toronto
West Coast: Electrical Specialty Co., Inc., San Francisco, Los Angeles, Seattle

BAKELITE

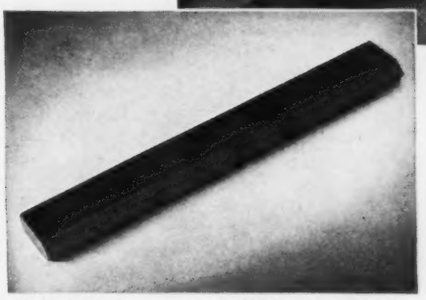
The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numeral sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

PLASTICS HEADQUARTERS





Because of its high mechanical and dielectric strength, Bakelite Laminated (Micarta) was also adopted for these bolt-insulating tubes used in the rotary converter armature shown above.



Bakelite Laminated (Micarta) wedge (3/16"x⅝"x4½") used to insulate armature coils and permanently lock them into position. (Top) Operator driving wedge into coil-slot of 1000-kw, 600v. rotary converter.

CONSULT BAKELITE PLASTICS HEADQUARTERS

More than 2000 plastic materials are available at this single, central source ...phenolic, urea, polystyrene and cellulose-acetate plastics offering wide option of dielectric properties, and resistance to impact, heat, chemicals and moisture. Supplied in many forms including:

IMPREGNATING VARNISH
LAMINATED STOCK SPECIAL CEMENTS
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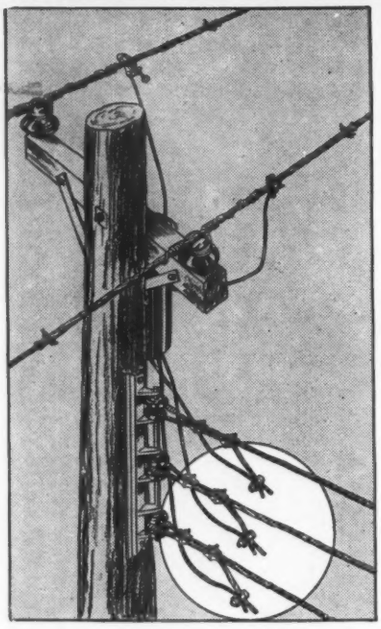


Rural line transformer pole with a secondary span to a yard pole.

RELIABLE
SOLDERLESS
CONNECTORS

Split bolt connectors have become standard in the industry. Reliable Electric offers well designed types for all applications. Shown above are aluminum to copper connectors which provide adequate spacing between the red and white wires to avoid galvanic corrosion.

Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
1145 W. CARROLL AVENUE • CHICAGO, ILLINOIS

REA Allots Funds Totaling $7,993,500

Rural Electrification Administration has announced allotments totaling $7,993,500. This brings allotments made by REA since it was established in 1935 to $249,708,793. Among the recent allotments are the following:

ARKANSAS—Craighead Electric Co-operative Corp., Robert Cherry, supt., Jonesboro, $150,000 to build 230 miles of line, 689 members in Craighead, Crittenden and Poinsett counties.

GEORGIA—Colquitt County Rural Electric Co., O. O. Owens, supt., Moultrie, $362,000 to build 487 miles of line, 1,619 members in Brooks, Tift, Echols, Cook, Atkinson, Lowndes, Thomas, Berrien and Lanier counties. Mitchell County Electric Membership Corp., Nathan M. Keadle, supt., Camilla, $264,000 to build 322 miles of line, 1,357 members in Baker, Miller, Mitchell, Early, Decatur, Worth and Daugherty counties. Jefferson County Electric Membership Corp., James B. Polhill, Jr., supt., Louisville, $306,000 to build 385 miles of line, 1,588 members in Jefferson, Emanuel, Johnson, Richmond, Columbia, Glascock, Warren, McDuffie, Washington, Burke and Jenkins counties.

IDAHO—Northern Idaho Rural Electrical Rehabilitation Assn., Inc., Glen A. Smothers, supt., Sandpoint, $196.000. of which $46,000 will be used to build 28 miles of line, 39 members in Bonner County, and $150,000 will be used for construction of generating plant.

ILLINOIS—Coles-Moultrie Electric Co-operative, John G. Waggoner, supt., Mattoon, $220,000 to build 215 miles of line, 696 members in Coles, Moultrie, Douglas, Piatt, Cumberland and Shelby counties.

INDIANA—Warren County REMC, Lee Rhode, supt., Williamsport, $160,000 to build 145 miles of line, 505 members in Benton, Vermillion and White counties. Newton County REMC, Floyd Weishaer, president, Kentland, $250.000 to build 263 miles of line, 649 members in Newton, Jasper and Benton counties.

IOWA—Wright County Rural Electric Co-operative, George C. Kirkstein, supt., Clarion, $145,000 to build 165 miles of line, 408 members in Wright, Hamilton, Webster, Franklin and Humbolt counties.

KANSAS—Brown-Atchison Electric Co-operative, Inc., E. E. Dorssom, supt., Horton, $78,000 to build 95 miles of line, 232 members in Nemaha, Brown, Atchison, Deniphan and Jackson counties.

KENTUCKY—Owen County Rural Electric Co-operative Corp., Chester Roland, supt., $267,000 to build 270 miles of line, 1.093 members in Carroll, Gallatin, Grant, Pendleton, Owen, Scott, Boone, Kenton and Campbell counties.

LOUISIANA—Southwest Louisiana Electric Membership Corp., Harry B. Bowles, supt., Lafayette, $98,000 to build 119 miles of line, 341 members in Avoyelles, St. Landry, Vermillion, Acadia, Lafayette and St. Martin Parishes.

MICHIGAN—Oceana Electric Co-operative, Loval Churchill, supt., Hart, $112,000 to build 91 miles of line, 310 members in Oceana, Mason and Newaygo counties.

MINNESOTA—Minnesota Valley Co-operative Light and Power Assn., Oscar W. Swanson, supt., Granite Falls, $110,000 to build 118 miles of line, 284 members in Lac Qui Parle, Chippewa and Swift counties. Stevens-Big Stone Co-operaitve Power Assn., Victor Hanson, supt., $136,000 to build 140 miles of line, 356 members in Big Stone and Stevens Counties. Lyons-Lincoln Electric Co-operative, Inc., V. Ostergaard, president, $239,000 to build 246 miles of line, 678 members in Lincoln and Lyons counties. Co-operative being formed, Peter Ingebretson, correspondent, Ulen, $150,000 to build 135 miles of line, 444 members in Becker, Norman, Polk and Mahnomen counties.

MISSISSIPPI—Coahoma Electric Power Assn., F. L. Stephenson, supt., Clarkedale, $142,000 to build 196 miles of line, 672 members in Quitman, Coahoma, Tunica, Tallahatchie and Sunflower counties.

NEBRASKA—Wayne County Rural Public Power Dist., Harry W. Noeding, supt., Wayne, $174,000 to build 225 miles of line, 548 members in Wayne, Dixon, Pierce and Thurston counties.

NORTH CAROLINA—Jones-Onslow Electric Membership Corp., E. B. Smith, president, Richlands, $284,000 to build 277 miles of line, 1,288 members in Onslow, Jones, Duplin and Lenoir counties.

NORTH DAKOTA—Verendrye Electric Co-operative, Inc., H. H. Blackstead, president, Verendrye, $90,000 to build 65 miles of line, 187 members in McHenry and Ward counties.

OHIO—Paulding-Putnam Electric Co-operative, Inc., V. E. Patterson, supt., Paulding, $166,000 to build 160 miles of line, 504 members in Henry, Putnam, Paulding, Defiance, Allen and Van Wert counties. Logan County Co-operative Power and Light Assn., E. W. Garling, supt., Bellefontaine, $139,000 to build 137 miles of line, 506 members in Logan and Hardin counties.

PENNSYLVANIA—Warren Electric Co-operative, W. L. Armitage, president, Warren, $187,000 to build 172 miles of line, 584 members in Warren and Erie counties. Somerset Rural Electric Co-operative, Inc., Harvey S. Jennings, supt., Somerset, $200,000 to build 164 miles of line, 1,362 members in Somerset and Fayette counties, Pa., and Garrett County, Md.

SOUTH CAROLINA—Edisto Electric Co-operative, Inc., H. E. Jennings, president, Bamberg, $49,000 to build 66 miles of line, 171 members in Dorchester county.

TEXAS—Fannin County Electric Co-operative, Inc., J. B. Richey, supt., Bonham, $129,000 to build 165 miles of line, 489 members in Fannin, Hunt, Collin, Lamar and Grayson counties. Fort Balknap Electric Co-operative, Inc., Roy Copeland, president, Olney, $131,000 to build 165 miles of line, 412 members in Young, Throckmorton and Archer counties.

VERMONT—Co-operative being formed, John A. Gordon, Attorney,, Barre, $68,000 to build 53 miles of line, 199 members in Washington County.

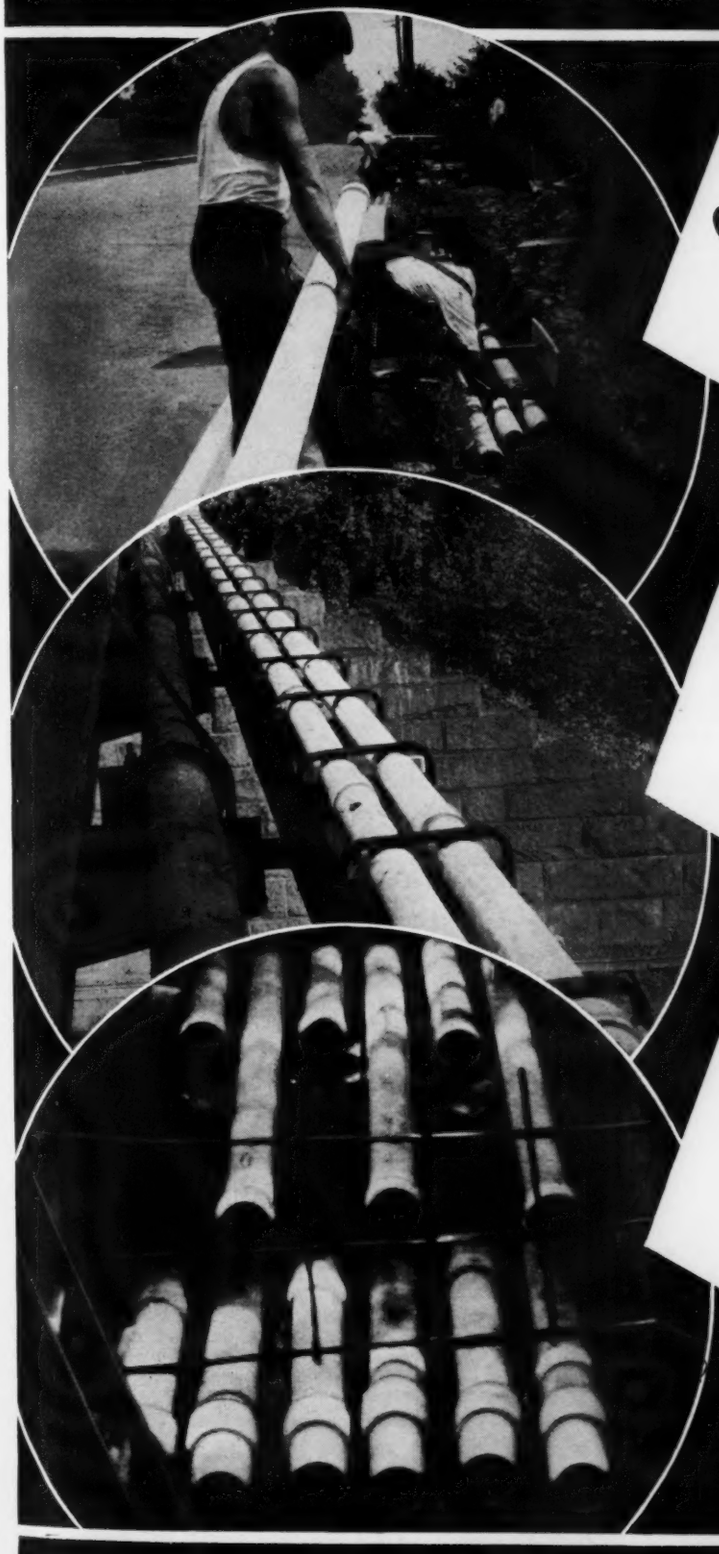
WISCONSIN—Oakdale Co-operative Electrical Assn., Lloyd McCaskey, supt., Oakdale, $161,000 to build 164 miles of line, 451 members in Monroe, Juneau, Jackson and Sauk counties.

•

Western States to Refund

Western States Utilities Co. will redeem on October 1, all of its first mortgage 20-year sinking fund 6 per cent gold bonds, series A, due October 1, 1945, at 105% and accrued interest.

THIS DURABLE CONDUIT



COSTS LESS TO INSTALL

Uniformly strong and durable, J-M Transite Conduit retains its true form under sustained loads—requires no concrete envelope underground or in exposed locations. Its long light lengths are easily handled, rapidly installed.

COSTS LESS TO MAINTAIN

Made of asbestos and cement, Transite Conduit is highly resistant to smoke, acid fumes, weather and corrosive soils. It will not rust, rot or decay, is completely incombustible, offers unusual resistance to flame and arc. Maintenance costs are kept to a minimum.

RETAINS ITS SMOOTH BORE

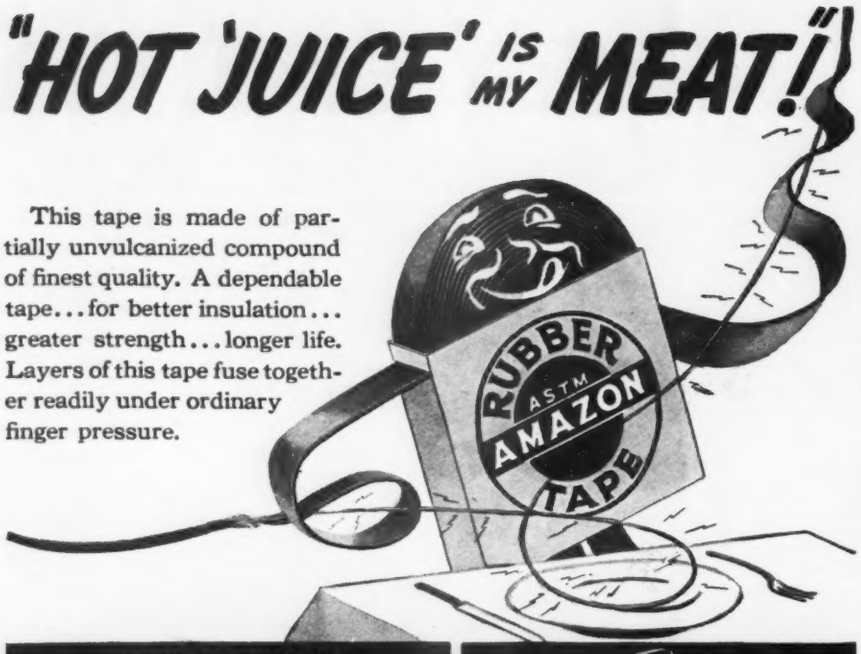
The original smooth interior of Transite Conduit *stays* smooth in service. Joints are tight and snug—free from jagged obstructions. Therefore, cable pulling is easier—long pulls may be made without injuring the sheath—cables can be easily removed.

You should have complete information about Transite Conduit and its thinner-walled companion product, J-M Transite Korduct. Write for Brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N.Y.

Johns-Manville TRANSITE CONDUIT

"HOT JUICE" IS MY MEAT!"

This tape is made of partially unvulcanized compound of finest quality. A dependable tape... for better insulation... greater strength... longer life. Layers of this tape fuse together readily under ordinary finger pressure.



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OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

Plain Hoss Sense
+ good basic quality
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★ ★ PRODUCTS

THE SUPERIOR SWITCHBOARD & DEVICES CO.
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★ Manufacturing ★
METER & RELAY TEST SWITCHES
METER & TRANSFORMER ENCLOSURES
METER TEST BLOCKS & TABLES

Sales Opportunities

PHENIX CITY, ALA.—Georgia Power Co., Atlanta, Ga., plans extensions in transmission lines to Phenix City and vicinity, passing through municipality to neighboring districts. Application has been made for a 30-year franchise.

GREENFIELD, IOWA—Town Council, O. L. Downing, town clerk, receives bids until October 3 for extensions and improvements in municipal electric power plant, including installation of new engine-generator unit and auxiliary equipment. Cost estimated at $92,500.

TEXAS CITY, TEX.—Republic Oil Refining Co. plans new steam-electric power plant at local oil refinery, with installation of turbo-generator unit and accessories, boilers and auxiliary equipment. Cost estimated about $250,000. Company also will install motors and controls, compressors, conveyors and other equipment in connection with expansion and improvements in refining plant. Cost estimated at $1,000,000, exclusive of power station noted. Proposed to begin work soon.

MEMPHIS, TENN.—Memphis Light, Gas and Water Commission has plans maturing for extensions and improvements in primary and secondary lines, including system recently acquired from Memphis Power & Light Co., to be operated as municipal property in future. It is proposed to ask bids and place contracts in October for material requirements. Additional feeder lines will be built from power substations on Popular Street and Willett Street, respectively; also, increase will be made in lines from power substation on Elzey Street. Extensions will be made in secondary lines and service facilities in different parts of city. Entire project will cost close to $1,000,000. Financing has been arranged through federal aid.

FORT PECK, MONT.—United States Engineer Office, Davidson building, Kansas City, Mo., receives bids until October 2 for furnishing and delivering one 38,889-kva. and one 16,667-kva. a.c. generating units with auxiliary equipment for installation in Fort Peck hydroelectric power plant, including installation and testing (Circular 435-40-2).

CINCINNATI, OHIO—Cincinnati Street Railway Co., Dixie Terminal Building, has filed plans for new power house on Reading Road, with installation to include five boilers, complete with stokers and accessories, and other equipment.

ST. MARYS, OHIO—Goodyear Tire & Rubber Co., Akron, Ohio, plans installation of motors and controls, regulators, transformers and accessories, switchgear, electric hoists, conveyors and other equipment in new branch multi-story plant near St. Marys, where company has secured a tract of about 60 acres of land. It will be used exclusively for production of mechanical rubber goods. A power house will be built. Work will be placed under way soon. Cost estimated at $1,000,000.

VIENNA, MD.—Delmarva Power Co., Vienna, a subsidiary of Eastern Shore Public Service Co., Salisbury, Md., plans installation of a 7500-kw. turbine-generating unit at proposed new steam-electric generating station at Vienna, recently referred to in these columns, with foundations for a second unit of like capacity, to be installed at later date. Plans are maturing for plant, with work scheduled to begin this fall, on completion of financing by parent company. Project will

include extensions in transmission and distributing lines. Eastern Shore company is arranging for consolidation of Delmarva company and Maryland Light & Power Company, another subsidiary, in connection with station project and affiliated expansion, estimated to cost $1,060,000.

CHICAGO, ILL.—Commonwealth Edison Co. has taken out a permit to build a new four-story indoor-type power substation and switch house for terminal service at 1121–45 Cermak Road, 104 x 252 feet, and will proceed with superstructure at once. Cost about $500,000, with transformers, switchgear and auxiliary equipment.

ADRIAN, MICH.—Bohn Aluminum & Brass Corp., Detroit, Mich., plans installation of motors and controls, electric hoists, conveyors and other equipment in new one-story addition, 200 x 320 feet, at branch metal goods manufacturing plant at Adrian. Cost over $175,000. Bids for erection will be asked soon.

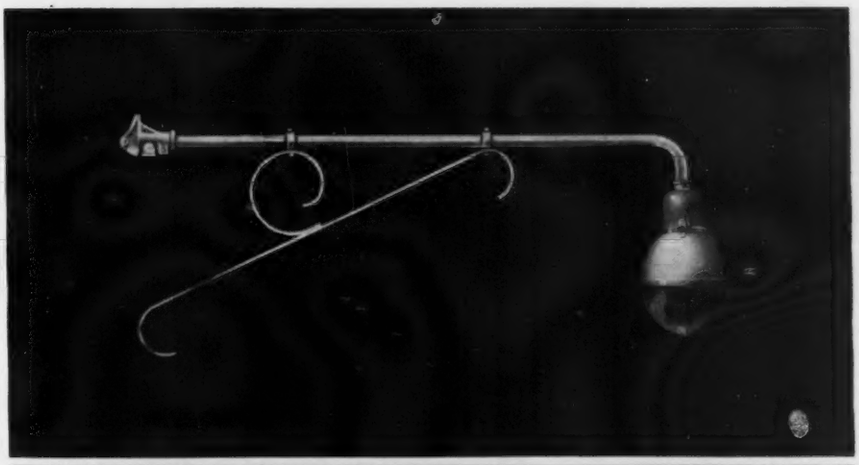
DENVER, COLO.—Purchasing Agent, Bureau of Reclamation, Denver, receives bids until September 29 for quantity of lighting units for illumination of control room at Grand Coulee hydro-electric power plant, Grand Coulee, Columbia Basin project, Wash. (Proposal A-38475-A).

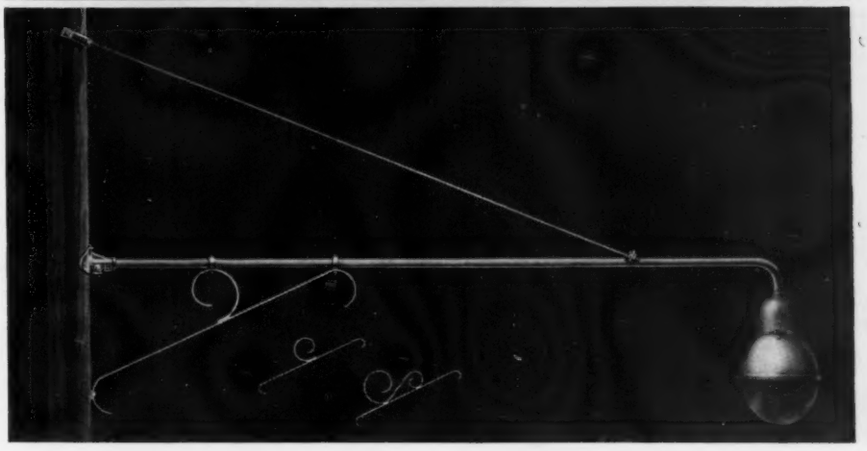
MILWAUKEE, WIS.—Wisconsin Electric Power Co., Milwaukee, has secured permission from State Public Service Commission to proceed with proposed expansion and improvements at local plant on Commerce Street, operated by Milwaukee Electric Railway & Light Co., lately noted in these columns. Work will include a station addition, 79 x 134 feet, and 110 feet high, with installation of new 35,000-kw. steam turbine-generator unit and accessories; high pressure boilers with rated output of 375,000 pounds of steam per hour, using pulverized coal as fuel; extensions in transformer and switching station, and miscellaneous auxiliary construction. Company also will make extensions in transmission and distributing lines. Work is scheduled to begin soon. Cost estimated at $4,137,000.

SABINA, OHIO—Village Council plans expansion and improvements in municipal electric power plant, including installation of additional equipment. Cost estimated about $42,000. A bond issue in that amount will be voted on at general election, November 7.

ROSEBURG, ORE.—Gatewood Lumber & Plywood Co., care of E. E. Gatewood, 2210 Tenth Street North, Seattle, Wash., head, recently chartered by Mr. Gatewood and associates, with capital of $1,000,000, plans installation of motors and controls, transformers and accessories, conveyors, loaders and other equipment in new lumber and plywood mill on Myrtle Creek, near Roseburg, where large tract of land has been secured. Plant will comprise several production units for large capacity. A power house will be built. Cost estimated about $750,000. Work is scheduled to begin in October.

PINE BLUFF, ARK.—Arkansas Power & Light Co., Pine Bluff, has plans maturing and will soon take bids for construction of a dam across upper Ouachita River at Blakely Mountain, about 14 miles from Hot Springs, for proposed new hydro-electric power development, recently referred to in these columns. New station will operate under a head of about 175 feet. Project will include new transmission lines for connection with present high-tension system, power substations, switching stations, and other operating facilities. Cost is estimated at $7,000,000.





NEW U-S ORNAMENTAL PIPE BRACKETS AND ORNAMENTAL MAST ARMS DESIGNED FOR MODERN LUMINAIRES

These U-S ornamental Pipe Brackets and ornamental Mast Arms, made of open hearth steel pipe, will not only add beauty and uniform appearance to your street and highway lighting installations but will also reduce maintenance costs. Pole plates, for inner or outer wiring—three different styles of scroll braces, are interchangeable . . . affording a wide variety of combinations in both Brackets and Mast Arms. Pipe sizes and lengths together with detailed information and illustrations are contained in our latest POLE LINE NEWS—Send for your copy today.

UTILITIES SERVICE CO.
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GALVANIZED PRODUCTS

Steel Strand

Telephone and Telegraph Wire

Where strains and stresses are heaviest, where corrosion takes its greatest toll, *Crapo* Galvanized Steel Strand and Telephone Wire constantly are proving their outstanding superiority. The heavy, tenaciously bonded zinc coating, maximum tensile strength and correct ductility insure longer life and lower maintenance cost. Insist upon *Crapo* Galvanized Products for better performance under all conditions! Ask your Jobber or write direct!

INDIANA STEEL & WIRE CO.
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Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.

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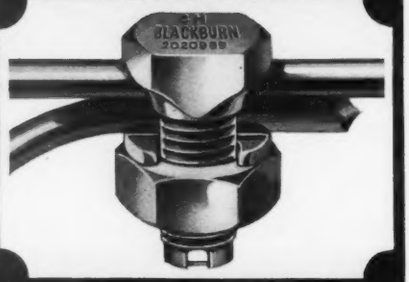


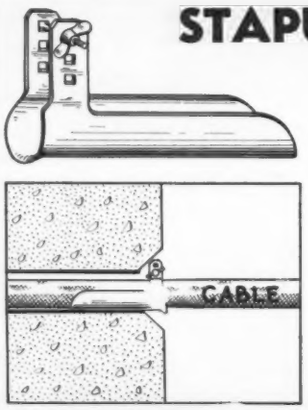
Blackburn Connectors are made completely of Duronze—actually more non-corrosive than pure copper or leaded commercial bronze commonly used in connectors. They contain no lead or zinc and will not season crack under the most severe weather conditions. For dependable lifetime connections

Specify Blackburn Connectors

JASPER BLACKBURN PRODUCTS CORP.

Main and Clinton Sts. St. Louis, Mo.

STAPUT FAIRLEADERS



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- *Cut Installation Costs*
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Staput Fairleaders are especially designed to eliminate cable abrasions at the duct mouth. They save you money in the installation—cutting labor time to 2 minutes. Rigid laboratory tests indicate a service-life of *200 years!* Made of ZINC to protect lead cable covering from electrolytic action. Held firmly by cadmium plated bolt and wing nut. Standard in underground systems of many progressive light and power companies.

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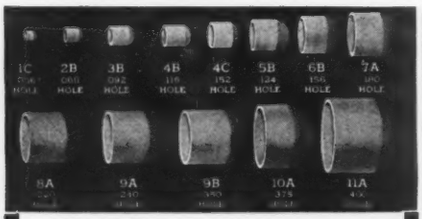

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Use Lavolain ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U. S. A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
TRENTON, N. J.

K-P-F

Self-aligning, self-releasing, full-floating, SILVER-PLATED contacts insure permanent ease of operation.

K-P-F ELECTRIC CO.
855 Howard St., San Francisco

Recent Rate Changes

NEW YORK POWER & LIGHT CORP.'s new rate schedule, effecting for consumers savings of more than $1,000,000 annually, has been approved by the New York Public Service Commission. Chairman Milo R. Maltbie of the commission said the company estimated that residential users would save $498,100 a year, commercial customers $478,800 and primary power users $20,300.

COLUMBUS & SOUTHERN OHIO ELECTRIC Co.'s proposal for a $300,000 light rate reduction instead of the $700,000 reduction recommended by Robert N. Tucker, superintendent of the city municipal light plant, has been accepted by Columbus city council. The five-year rate ordinance, embracing this reduction, will be submitted to voters at the election November 7 without the signature of Mayor Myron B. Gessaman. Council accepted the ordinance with the definite understanding that a $700,000 improvement program will be started during the coming year on street-car and trolley coach operations with total expenditures to reach $2,500,000 during the five-year period. The average power rate reduction for consumers will be 13 per cent, affecting more than 79,000 residential consumers. Present rates are 5 cents per kilowatt-hour for the first 30 kw.-hr.; 4½ cents per kilowatt-hour for the next 60 kw.-hr.; 4 cents per kilowatt-hour for next 60 kw.-hr.; and 3 cents per kilowatt-hour for all over 150 kw.-hr. New rates are: 4½ cents per kilowatt-hour for first 40 kw.-hr.; 4 cents per kilowatt-hour for next 60 kw.-hr.; 3 cents per kilowatt-hour for next 60 kw.-hr.; and 2½ cents per kilowatt-hour for all in excess of 160 kw.-hr.

NEBRASKA POWER CO. has reduced residential rates in Omaha and Council Bluffs by $450,000 annually. This is the third reduction in three years, one in January, 1936, amounting to $500,000 and one in February last, applying to large users, amounting to $100,000. At Columbus, General Manager Kramer of the Loup River public power district indicated plans for purchase of the Nebraska Power Co. would be dropped. He said that "we have lost interest" in the missionary work being done in the state for the cause of public power.

ALBUQUERQUE GAS & ELECTRIC CO.'s rate reduction, amounting to $90,115 annually, has been accepted by the city commission. Residential lighting bills will be reduced $41,000, commercial lighting $44,000, the combination large light and power group $2,500 and the city's street lighting bill $2,615.

NORTHERN STATES POWER CO. has been authorized by the Wisconsin Public Service Commission to revise its electric rates in 16 western counties. Total savings to customers will amount to approximately $60,000 a year.

CITIZENS ELECTRIC CO., Hot Springs, Ark., will reduce its rates to customers to effect savings of approximately $45,000 annually. The new rates will become effective November 1.

TAMPA ELECTRIC CO. will make a rate adjustment which will result in lower electric bills for large wholesale consumers. Wholesale consumers using more than 100 kw.-hr. on the power service will be charged on the basis of wholesale power rates for both their power and lighting. Heretofore, they were charged one rate for their lighting and a lower rate for their power. The lump power rate previously was allowed only users of 250 kw.-hr. or more.

ABINGTON ELECTRIC CO., Clark's Summit, Pa., has announced a new schedule of electric rates, the second reduction in the past several months. The new rates will mean a saving of 40 cents per month to consumers using in excess of 200 kw.-hr. Under the old rate the cost per month was $9.10 for 200 kilowatts, with the new tariff bringing the cost down to $8.70.

ILLINOIS COMMERCE COMMISSION has announced that electric rate revisions in the state effective during the month of August resulted in an estimated aggregate reduction of $28,060.

•

Municipal Plants

NORTH LITTLE ROCK, ARK.—Mayor O. W. Neely and City Council have under consideration the possibility of constructing a municipal light and power plant.

NORTH BALTIMORE, OHIO—Second injunction suit to restrain village officials from erecting a municipal power plant has been filed by the Central Ohio Light & Power Co. Wood County Common Pleas Court has issued a temporary injunction pending a hearing. The utility contends that issuance of $127,221 of bonds for the project would violate the state laws, because the operation of the plant would compete with private enterprise. Previously, the company unsuccessfully attacked the validity of the election, at which voters authorized village council to draft plans for the municipal plant.

GAINESVILLE, TEX.—City Council has under consideration a proposal to purchase the distribution system in this city, belonging to the Texas Power & Light Co. The plan is to pay for the system with revenue bonds. In the event that the purchase plan falls through, it is expected that city officials will consider the purchase of an additional generating unit at the city waterworks electrical plant for the serving of additional customers.

MT. HOREB, WIS.—At a special election held recently residents voted 492 to 145 in favor of acquiring the electric plant and equipment of the Mt. Horeb Electric Co., a subsidiary of the Wisconsin Power & Light Co. Acquisition of the plant will cost the village approximately $70,000 and it has one year in which to prepare and sell municipal bonds to raise the funds for the purchase. It was the third time in the past few years that residents have voted in favor of purchasing the plant, but these elections were questioned in court.

•

Drops Suspension Case

Having received amendments covering previously omitted material which the Securities and Exchange Commission considered essential in the interest of the public and investors, the board has dismissed proceedings to determine whether the Allegemeine Elektricitäts Gesellschaft twenty-year 7 per cent sinking fund gold debentures due 1945, fifteen-year 6½ per cent sinking fund gold debentures due 1940 and twenty-year 6 per cent sinking fund gold debentures due 1948 should be suspended or withdrawn from registration on the New York Stock Exchange.

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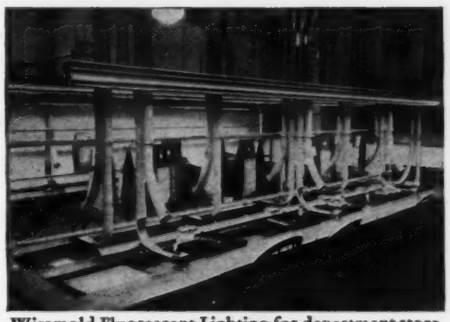

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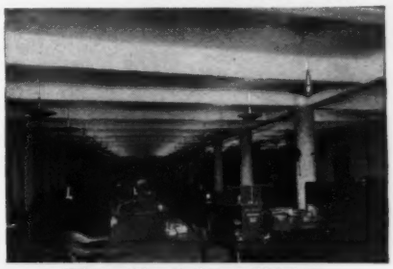

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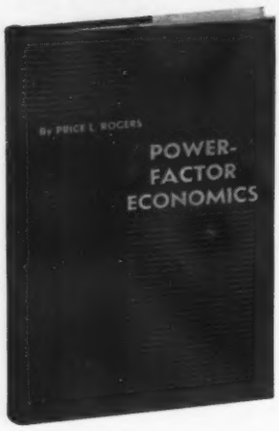

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Modernization of Schuylkill Station Switch House

[*Continued from page* 65]

phase and ground partial differential time delay back-up system and a high-speed ground differential system. These relays will be fed from two differentially connected current transformer systems. The first, or source system, employs matched current transformers of like ratio installed in the three phases of all sources of input to the bus, so located that they will overlap the individual protection of the sources. The second, or line system, employs a sheath type current transformer located around the outgoing cable of each line and is responsive to residual currents only.

Source system relays will be fed from the source current transformer system and will consist of time delay overcurrent phase and ground relays set selectively with the overcurrent relays on the lines. The equivalent of differential protection of the bus section against phase-to-phase faults is obtained by an additional set of instantaneous overcurrent phase elements set higher than the maximum current obtainable on a line fault which is limited in magnitude by the line reactors.

Ground-Fault Protection

The line system provides complete differential protection against ground faults on the main bus sections by a high-speed ground relay differentially connected between the residual circuit of the source current transformer system and the line current transformer system.

It is expected that bus faults will be removed in approximately 10 cycles, which includes 8 cycles for the circuit breakers.

The soot-producing characteristic of insulation warranted the continuation of the company's long-established practice of using bare copper bars and channels.

Problem of carrying ground fault currents is receiving attention; provisions will be made so that a low-resistance path to ground will be available where arcs are likely to occur. Consideration was given to housing the new equipment in metal compartments, but it was decided to erect concrete compartments and ground all insulator, disconnecting switch and fuse bases and current transformer cases. While this can be done readily where new compartments and equipment are being installed, it is not economically feasible to ground the bases of all existing equipment. Therefore, all existing disconnecting switch and fuse bases not now grounded will be grounded and larger copper connections to current transformer cases will be provided, since it is felt that these are the most likely places for arcs to occur. In addition to this, the ground network in the switch-house will be reinforced with larger copper, and where it is not possible to determine definitely that certain parts of the ground network are connected together, new connections will be provided in order to be certain that the ground grid is adequate.

Section Lighting

Illumination of the individual sections of the switch-house is an important feature, not only for regular operation but at times of emergency. Improvements in the existing lighting scheme are being developed whereby trouble in one section will not affect the lighting supply to the adjacent sections. Also, provisions will be made for portable emergency lighting to a section in trouble should the lighting fixtures or supply in this section become damaged, the supply for the portable lights coming from an adjacent section.

Introduction of the ring bus scheme does not introduce any new problems of ventilation, but this matter is being reviewed in connection with increased loading.

•

Large Apartment Order Placed with Kelvinator

An exceptionally large order for electric refrigerators has been placed with the Kelvinator division of Nash-Kelvinator Corp. by the Fred F. French Co. of New York, it was announced by John J. Massimi, director of Kelvinator apartment house sales.

The new refrigerators will be installed in the 91 buildings of the French Company's Interlachen Gardens apartment project in the town of Eastchester, Westchester County, New York. Just a year ago, Mr. Massimi said, the French company awarded Kelvinator the largest replacement contract in the history of the refrigeration industry, which provided for approximately 1,500 Kelvinators.

Municipals Chiefly in Three Regions

As the Census Bureau continues to release preliminary statistics based on the canvass for 1937 various relationships become evident. Recent publications, from which the accompanying table has been compiled, show the installed generator ratings in privately owned and municipally owned establishments by states and regions, as well as corresponding totals. The last-named figures include cooperatives, Federal and other plants not separately listed by regions totaling 1,788,842 kw.

Of the total capacity, private companies have 88.3 per cent, municipals have 6.8 per cent, the other groups named above have 4.9 per cent. The highest percentage of municipal capacity is found in the Pacific States.

That region comprises more than a third of the country's total for municipally owned plants. (ELECTRICAL WORLD's Supplement of May 7, 1938, shows that five such systems—Los Angeles, Seattle, Tacoma, Hetch Hetchy of San Francisco and Oakland's East Bay accounted in 1937 for about 650,000 kw.)

Installed Capacity, Kw.
(U. S. Census, 1937)

Region	Private	Municipal	Total*
N. England	2,627,236	73,471	2,752,721
M. Atlantic	8,594,017	107,630	8,838,327
E. N. Central....	7,586,745	563,041	8,289,069
W. N. Central...	2,281,434	439,801	2,728,008
So. Atlantic.....	3,973,277	179,274	4,447,880
E. S. Central.....	1,297,244	55,477	1,857,809
W. S. Central....	1,622,546	144,591	1,791,336
Mountain	1,063,717	60,201	1,662,650
Pacific	3,146,702	875,861	4,113,307
U. S.	32,192,918	2,499,347	36,481,107

*Includes co-operatives, federal, state and other.

The two North Central regions together have 1,000,000 kw. In the other six regions municipal plants have found less favor; their total capacity is 21,350,723 kw., of which 620,644 kw., or 2.9 per cent, is in municipally owned plants.

•

Carrier Installs Air Unit System on S.S. America

The *S. S. America* of the United States Lines, launched on August 31, carries the largest air-conditioning system ever installed in a ship built in the United States. The *America* system was installed under the supervision of Willis H. Carrier, chairman of the board of Carrier Corp., Syracuse, N. Y.

The Carrier system supplies air conditioning for the cabin dining salon, tourist dining salon, third-class dining salon and separate units for barber and beauty shops in each class. In addition the *America* contains 41,400 cu.ft. of cargo refrigeration.

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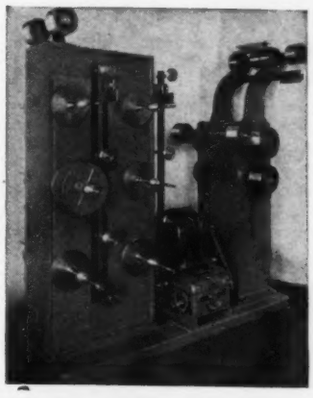

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Series Capacitors Regulate Rural Voltages Economically

[*Continued from page* 59]

ranged to show whether the contactor has operated between inspections. In this way we know it has operated at least three times.

We have just made a second installation of a somewhat larger outfit which was completely constructed by one of the larger manufacturers. Two manufacturers are now prepared to quote prices and deliveries on a wide range of sizes. We consider the matter as yet somewhat in the experimental stage, but are enthusiastic as it seems to have many attractive features. This being a current-controlled device, it of course has no response to voltage fluctuations originating ahead of it, but the regulation due to current flowing through it is uniform.

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A series capacitor must be chosen with somewhat more careful consideration of the application than some other methods of regulation. With high power factors, they are usually not suitable. However, for use where they are suitable, they seem to have a number of very definite advantages over other equipment, such as step boosters. The most important advantages are: Better regulation, absence of flicker in voltage, better protection from overloads, less trouble from lightning, lower cost of equipment, lower cost of installation and less space required on the pole.

•

Cooler Sales Rise; Air Unit Sales Up 8%

Electric room cooler sales showed a remarkable increase during July, reaching the all-time high of 312 units for any single month, as compared with 96 in the similar period last year, an increase of 225 per cent. Total number of room coolers sold this year during the seven-month period totals 717, as compared with 303 last year.

Central-plant air-conditioning systems sold during the first seven months of 1939 show an increase of 8 per cent in capacity over the same period in 1938 and a decrease of 26 per cent in the number of installations. At the end of July 258 central-plant systems totaling 3,773 hp. had been contracted for, as against 262 installations representing 3,499 hp. during the similar period.

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☐ Klein Kord Fabric Safety Straps.
☐ Pocket Tool Guide.

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Merchandising for Municipalities Develops New Residential Markets

[*Continued from page 67*]

advertisements which feature the various electrical appliances are strictly promotional in nature and do not mention the names of any particular product. Local electric appliance dealers are encouraged to "tie in" with these promotional advertisements with ads of their own, featuring the particular line or lines which they sell. All ads in the co-operative series bear the city's signature and the utility's name does not appear in the ads except in a line of small type under the city's signature, which reads as follows: "One of a series of ads published in co-operation with the Georgia Power Company."

A large all-electric cooking school sponsored by the leading woman's organization in the town, and in which all the local dealers co-operate, is usually conducted near the end of the advertising campaign and is "tied in" in the advertising. These schools are conducted by the local home economist or by some well-known economist from the utility's headquarters staff. As the school is sponsored by the leading woman's club, the local papers are always glad to give it considerable publicity for several weeks prior to the actual sessions. In addition, all of the local dealers run ads featuring their individual lines which "tie in" with the large co-operative advertisements run by the city and power company. This large amount of publicity, running over a period of several weeks, has been most successful, in every instance, in getting the program off to a good start by acquainting the citizens with the plan, the advantages of electrical appliances and lowness of the local rates.

This plan has been in effect in the various towns for periods varying from one to 26 months. The results from both a financial and good-will standpoint have been most pleasing in every town. During the time the plan has been in effect the new-business representatives assigned to wholesale towns have obtained new business aggregating 24,186,550 kw.-hr. per year, made up as follows:

	Annual Kw.-Hr. Consumption
Commercial and industrial power	11,156,984
Commercial and industrial lighting	6,072,203
Merchandise sold	5,996,979
Homelighting	960,384
	24,186,550

It is estimated that this new business will result in additional annual revenue of $565,835 to the municipalities and $200,259 to the utility. Total cost to the utility of acquiring this business has amounted to about 50 cents per dollar of new annual revenue. As previously stated, salaries and expenses of the sales representatives and home economists are paid in full by the Georgia Power Company. The sales representatives are paid a fixed salary plus a load bonus at a fixed rate per thousand kilowatt hours of annual new business. The home economists are paid a straight salary.

In the matter of new business secured, particularly interesting was the 1937 record of merchandise sales by dealers in wholesale towns. In those towns in which the plan was in effect for the full year 13 per cent of the residential customers were sold refrigerators, 5 per cent ranges and 1 per cent water heaters.

Increases Net Revenue

Without exception, all of the towns in which the plan has been placed in effect have reported increases in net as well as gross revenues. This has been accomplished notwithstanding drastic rate reductions in many instances. Most of these reductions were made possible because of the availability and application of this plan. Thus, the plan has not only made money for the city governments but it has also saved their citizens considerable amounts in the form of reduced electric bills.

Needless to say, the officials of all of the towns are delighted with the results being secured. They are most appreciative of the utility's efforts and in most cases treat the sales representative as one of the municipality's official family. He is consulted on all matters affecting the electrical department and his recommendations are generally followed exactly. In a number of instances the city officials have voluntarily written letters to the utility commending the results secured and thanking it for its assistance.

The plan has proved most profitable to the city governments, the citizens of the municipalities and the utility. The results secured have far exceeded the expectations of the municipalities and utility when the plan was inaugurated.

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POSITIONS WANTED

(See also "Selling Opportunity Wanted")

GRAD. ELECTRICAL ENGINEER with 14 years development and research experience desires responsible position. PW-660, Electrical World, 330 W. 42nd St., New York, N. Y.

PLANT ENGINEERING: Diversified experience, supervision large development valuation, custodian fixed capital records, job planning for maintenance and construction, field supervision, background—time studies, production layout, power house. Single, any location. PW-659, Electrical World, 330 West 42nd St., New York, N. Y.

CHIEF ELECTRICIAN. 22 years experience in Power application. Broad conduit construction exp. Outdoor and indoor substation—construction and maintenance. Extensive switchboard wiring. Installation of meters, Pot and current-Transformers, Testblocks. Polarity testing of Power-transformers. Able to make synchronizing test and phase-rotation test of parallel operation of Generators, Transformer banks to be operated in parallel. Broad "markup" experience on 11KV Loop-system. Experience in reconnecting and rewinding 3 Phase Motors. AC and DC Elevator work. Thorough knowledge of DC—motors and controls. DC-AC "cutover" work. Able to do wiring and construction work from blue prints. Expert trouble shooting. Considerable technical knowledge. Safety application of Rubber gloves, blankets, glow detector. Recondition and testing of transformer oil up to 30,000 volts. 12 years experience with private contractor, 10 years with two public-utility companies. Steady employment for the last 14 years. Now employed. Wishes to make permanent connection with either: Public Utility Co. that is doing construction work or modernizing Plant facilities. Electrical contractor, or Plant that needs Electrician with wide experience and accurate knowledge. Letter of recommendation furnished. Able to pass any physical examination. Age 42. Married. American citizen. PW-663, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRICAL ENGINEER Draftsman. Young man age 27, technical graduate, experienced in substation, distribution, and transmission line design and construction. Available on two weeks' notice. PW-664, Electrical World, 330 W. 42nd St., New York, N. Y.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY WANTED

PACIFIC COAST REPRESENTATION. Responsible person with 25 years experience in manufacture engineering and sales solicits Pacific Coast Representation arrangement with large Eastern companies for all types of electrical equipment new or reconditioned. Excellent contacts in Northern California with industrials, utilities and dealers. RA-666, Electrical World, 330 W. 42nd St., New York, N. Y.